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STATEMENT OF JOE LA GRONE
MANAGER, OAK RIDGE OPERATIONS,
U. S. DEPARTMENT OF ENERGY,
BEFORE THE SUBCOMMITTEES
ON ENERGY RESEARCH AND PRODUCTION
AND OVERSIGHT AND INVESTIGATION
OF THE HOUSE COMMITTEE ON
SCIENCE AND TECHNOLOGY

OAK RIDGE, TENNESSEE

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STATEMENT BY
JOE LA GRONE, MANAGER
OAK RIDGE OPERATIONS OFFICE
U. S. DEPARTMENT OF ENERGY

Mr. Chairman and members of the Committee:

My name is Joe La Grone. Since April of this year, I have been Manager of the Oak Ridge Operations Office of DOE. I have been with DOE and its predecessor agencies, the Atomic Energy Commission and the Energy Research and Development Administration, for the past 20 years, the last five of which I served as Manager of the San Francisco Operations Office.

As you know, on May 17, 1983, Oak Ridge Operations Office released a report entitled "Mercury Inventory at Y-12 Plant 1950 through 1977." This ten-page report indicated that more than 475,000 pounds of mercury had been lost to a local creek; that between 150,000 and 225,000 pounds of mercury had been lost to the earth; that 30,000 pounds had been lost to the air; and that 1,880,699 pounds of mercury were still unaccounted for in 1977. Release of this information, naturally, resulted in a lot of concern and questions from the media, state and federal regulatory bodies and local citizens.

I would like to take this opportunity to thank you for holding these proceedings, and providing further opportunity to discuss this matter. I believe that one of the most important steps in solving any problem is getting the facts out on the table where everyone can examine them. The proceedings today should be a great help in the process of bringing out all the facts about the mercury situation and other environmental concerns at DOE's Oak Ridge facilities.

In beginning a discussion of the mercury inventory situation at the Y-12 Plant, it's useful to recall the circumstances surrounding the large-scale lithium separation process at Y-12 between 1950 and 1963.

HISTORICAL REVIEW

Lithium enriched in the lithium-6 isotope is used in the production of lithium deuteride fuel for thermonuclear weapons. In the early 1950's, weapons tests confirmed the success of thermonuclear weapons utilizing lithium deuteride. The United States, therefore, launched a crash program to produce large quantities of enriched lithium. The Oak Ridge Y-12 Plant was chosen as the production site and two large scale production facilities were completed and placed in operation during the period of December 1953 through September 1955. That these facilities were completed in the remarkably short time of less than two years reflects the fact that they were constructed because of strong national security concerns regarding thermonuclear weapons.

The lithium separation processes used at Y-12 required large quantities of mercury. Photographs 1 through 3 show process equipment. The mercury was obtained from the General Services Administration (GSA) under a series of Presidential directives to the Director of the Office of Defense Mobilization, stating the mercury was for use by the AEC in the production of weapons for the common defense. The mercury was shipped to Y-12 from the GSA stockpile and other sources in flasks nominally containing 76 pounds of mercury. Due to the high priority of getting the facilities in operation, the incoming mercury was added directly into process equipment upon receipt, with no measurement of the contents of the flasks. Photographs 4 and 5 show how the flasks were received and the emptying operation.

The lithium separation activity at the Y-12 Plant was in two stages: (1) development and pilot plant facilities, and (2) production facilities. Development and pilot plant facilities were operated in four buildings at Y-12 from 1950 through 1955. By the end of 1955, production facilities were in operation and all development and pilot plant operations at Y-12 were shut down. Stripping and decontamination of the development and pilot plant facilities was completed by mid-1958.

Large scale production facilities were operated for lithium separation at Y-12 during the period of 1953 through 1963. These production plants were operated as follows:

- o BETA-4 plant began operation in August 1953. It was shut down and placed in standby in February 1956.
- o ALPHA-4 plant began operation in June 1955. It was shut down and placed in standby in December 1962.
- o ALPHA-5 plant operated from January 1955 through March 1959. It was in standby from March 1959 to December 1962, when it was placed in partial operation through May 1963 for the purpose of producing lithium-7 for the agency's reactor development program. After this six-month effort, it was shut down and again placed in standby.

After the production plants were placed in standby, decontamination activities were initiated.

- o The mercury was removed from the BETA-4 production plant in 1956, and stripping and decontamination was completed in 1957.
- o The ALPHA-5 production plant was drained, stripped and decontaminated in 1965 and 1966.
- o All mercury was drained from the ALPHA-4 production plant and the equipment was flushed by 1977. The process equipment is still in place, though it has not operated since December 1962.

1977 REPORT

In 1977, ORO requested the Y-12 operating contractor, Union Carbide Corporation, to try to reconstruct the mercury inventory situation as it had existed at Y-12 in earlier times. We have not been able to determine why the inventory reconstruction was requested. Two contractor employees spent two weeks gathering what information they could, sometimes from documents, sometimes from personal recollections of employees who had worked in the lithium separation program. The result of their efforts was the previously mentioned report titled "Mercury Inventory at Y-12 Plant 1950 through 1977," which showed spills and losses to the environment of about 650,000 pounds of mercury, and about 1.9 million pounds unaccounted for. The report was classified as Secret Restricted Data under the Atomic Energy Act of 1954, as amended, because some of the information pertained to the production of special nuclear materials for nuclear weapons.

In October 1982, during a meeting between representatives of the Tennessee Department of Health and Environment and ORO regarding surface and groundwater conditions around Y-12, the matter of mercury in East Fork Poplar Creek was discussed. In response to a general question regarding whether there were any ORO documents that discussed mercury losses, the general answer was given that, if there were, they were likely to be classified. The matter was not pursued by either party, but, in a later newspaper interview, a TDHE representative mentioned the classified reports on mercury.

These references to classified reports apparently prompted a Freedom of Information Act request by a local newspaper, The Appalachian Observer, in November 1982 for all reports on mercury spillages and emissions at ORO. The only responsive documents identified were the 1977 Report and an investigative report done at the time of a 1966 spill. The 1966 document was made available to The Appalachian Observer in late December 1982, and the 1977 document underwent the declassification review process required by DOE's regulations implementing the Freedom of Information Act. It was released in May of this year, after identification and deletion of the Secret Restricted Data. Simultaneously with our release of the 1977 Report to the requesting newspaper, we furnished the report to the State, EPA, the City of Oak Ridge and other local media. The 1966 spill had received media attention in the year of the spill, so no further action was taken on that report. A copy of the unclassified version of the 1977 Report is attached as Exhibit 1 to my testimony.

After my arrival in Oak Ridge in late April, I observed that environmental matters were receiving a great deal of attention, particularly from the media and regulatory bodies. I learned that discussions were underway among ORO, EPA and the Tennessee Department of Health and Environment regarding conditions at the Y-12 Plant that were believed to be out of compliance with state and federal regulations and standards. I was informed of the mercury situation, and the 1977 Report that was undergoing declassification review. Based on all of this, I felt that an additional focus, a

greater concentration, was needed on environmental matters at ORO. Therefore, on May 9, 1983, I established a 12-member multidisciplinary ORO Environmental Task Group. The charter of this group was to learn as much as possible about the Y-12 mercury situation, discern what potential problems were present and offer proposed solutions. At its inception, I informed the Task Group that, once the mercury situation was under control, the group was to expand its problem spotting and solving activities to the entire Y-12 Plant, then the other Oak Ridge facilities, and then to the plants located in other states that are under ORO responsibility.

The Task Group has been very active, and it is this group that has formulated or implemented many of the mercury-related activities of ORO during the past month and one-half. For instance, the Task Group arranged for the consultation with mercury expert Dr. Thomas Clarkson, a Ph.D., professor and head of the Division of Toxicology and Director of Environmental Health Sciences at the University of Rochester School of Medicine. The Task Group also suggested the sediment feeding studies that have been performed by the Oak Ridge Research Institute, which I will discuss later. I offered sampling for any citizen of Oak Ridge who had concerns about mercury contamination of his or her water, soil, air or garden, and the Task Force has arranged for this sampling, plus a more comprehensive sampling program of Oak Ridge areas not studied before or for parameters not previously studied in these particular areas, such as radioactivity and PCB's. In addition, the Task Group has directed the preliminary steps for a well-drilling program to locate, if

possible, pockets of mercury resulting from spills at the Y-12 Plant and to identify any contamination of area groundwater by mercury. Some members of the Task Group are also participating in the Interagency Task Force established under the Memorandum of Understanding we executed with the State and EPA, which I'll discuss in more detail later.

Some of the actions that I and my staff have taken, independent of the Task Group, are reviewing information, findings and actions with local organizations, such as the Oak Ridge City Council, the Oak Ridge Chamber of Commerce and a group of Scarboro community residents, about the 1977 Report and our subsequent sampling data. I also offered to appropriate City, State and Federal officials, as well as the U. S. Senators and Representatives from this area, briefings on the 1977 Report in its full text, so they would have the complete picture of the Y-12 mercury inventory situation.

We have also contacted the National Center for Disease Control, and requested their advice on additional steps which we should undertake with regard to the mercury in the environment in the Oak Ridge area. We are pleased that NCDC has agreed to have their experts review all our data and we will be collecting any additional data they may request to aid them in determining what further actions or studies by DOE or NCDC may be appropriate.

A question that has been raised time and again about the 1977 Report is "Why weren't the unclassified portions of the report, such as the losses to the environment, made public in 1977?" I don't know the answer, but--because that question hasn't been answered--and because questions have been raised about other documents and activities related to mercury, shortly after release of the 1977 Report I directed auditors from ORO's Office of Performance Evaluation to begin an inquiry into these matters. I specifically asked for the auditors to evaluate the numbers in the 1977 Report, and I will give you the results of that evaluation a little later. There are other 1977 and post-1977 reports and activities that I have asked the auditors to look into: the Elwood Report, information furnished other agencies (including TVA) in this time period, two ORO environmental assessments issued subsequent to the 1977 Report, and the Steven Gough matter. I requested DOE's Office of Inspector General to conduct a full and complete investigation into all allegations of wrongdoing regarding these matters, and I have directed that the Office of Performance Evaluation's administrative inquiry shall be in support of the IG's investigation. We don't have all the answers yet, but we are looking. As a part of this, we're trying to determine why things happened the way they did, and we are actively seeking information and answers. If there is any wrongdoing identified, it will be dealt with promptly.

Information that we develop will be made available to the public on these topics, as well as the sampling data, results of

studies, new expert opinions, etc. In that regard, I'll mention one of the steps we've taken to assure public access to mercury information. With the cooperation of the Oak Ridge Public Library, we placed a package of basic mercury materials in the library, which we've been supplementing with new information as it has become available. When sampling data, analyses, reports and similar information is furnished to EPA and the Tennessee Department of Health and Environment, we also furnish it to the City of Oak Ridge and place a copy in the library. In this manner, the citizens of Oak Ridge can have prompt access to all the information to which the media and public officials are referring.

MERCURY ACCOUNTABILITY

As I mentioned earlier, I asked members of ORO's Office of Performance Evaluation to conduct, to the extent possible, an audit verification of the figures contained in the report. In addition, Union Carbide Corporation has conducted a separate review of all available information from the records it maintains. Since we and Union Carbide are trying to recreate events of some 20 years ago, from a time when records are less complete than we would like, the results are still far from exact. We have, however, been able to refine the figures, setting ranges in some cases, establishing confidence factors in others and identifying what may be a basic error in one instance.

The following information is based on page 5 of the 1977 Report. It shows the data in the original report and the more refined figures based on the past two months of activity.

	<u>1977</u>	<u>1983</u>
Measured loss, 9201-5, March 1966	49,853	49,853
Other Spill losses (estimated)	*	375,000
Creek losses through 1972 (soluble)	235,000	(
Creek losses through 1964 (entrained, estimated)	235,000	(243,444 - (470,000 (total
Mercury in sludge removed from New Hope Pond - 1972	7,200	6,629
Airborne losses 1955-1963	30,000	51,300
Mercury in New Hope Pond 1973-1983		8,475
Total mercury unaccounted for	<u>1,880,699</u>	<u>1,539,863 - 1,766,419</u>
Total mercury lost or unaccounted for	2,437,752	2,501,120

*Estimated spill losses were not considered accounted for in the 1977 Report.

What these figures indicate is that, while the bottom line numbers stay basically the same, in that about 2.5 million pounds of mercury were lost or are still unaccounted for, we believe we have a more precise figure on the quantities of mercury that we now consider accounted for. Part of the increase in material accounted for occurs in categories where figures are still classified. A substantial addition to accounted for material is the result of including spill quantities, which should have been considered accounted for in the original report but were not. This figure

(375,000 pounds), therefore, appears as a separate 1983 column entry and results in a reduction in the entry for "Total mercury unaccounted for."

Airborne losses, it will be noted, are estimated to be 75 percent higher than previously reported. The 1977 Report failed to consider three other sources of airborne losses, BETA-4 smelting losses of 5,000 pounds, BETA-4 stack losses of 8,300 pounds, and an additional estimated 8,000 pounds from ALPHA-4 and ALPHA-5.

One area where we still have a substantial range is the figure for creek losses, in that creek losses may be only half as great as indicated in the 1977 Report. Footnote 8, on page 5, of the 1977 Report states, with regard to entrained mercury losses to the creek: "No analysis available on entrained material. Estimated to be equal to soluble mercury." The 1977 Report, therefore, doubled the measured amount of mercury to account for what was presumed to be the unmeasured insoluble material. Those involved in the analysis of mercury in Y-12 samples during this period state, however, that the entrained material was, in fact, measured for all except 2.5 years in the mid-1970's, when creek losses were very low. If this is an accurate statement, the doubling in the 1977 Report for creek losses was unnecessary.

The 243,444 figure shown as the low end of the range is made up of the following components:

Discharges to Creek (soluble and insoluble suspended)	218,869
Metallic mercury and bottom sludges (before New Hope Pond)	7,500
Storm flow losses	1,275
1950-1955 -- all other losses (estimated)	<u>15,800</u>
	243,444

A confidence factor of 24,000 pounds has been ascribed to the "discharges to the creek" figure, plus or minus, so the low figure range is approximately 220,000 to 268,000 pounds. Because of the remaining uncertainties with regard to the figure, we consider the range to be 220,000 pounds to 470,000 pounds. Even with our continuing audit activity, we will probably not be able to establish a firm figure. We will, however, share this information about uncertainty regarding losses to the creek with the Task Force under the MOU, since it may be of help to that group in its study of East Fork Poplar Creek.

I've been talking about creek losses, a term that is used in the 1977 Report, and that's really a misnomer. While the mercury was lost from the separation process, the term I used earlier, "discharges to the creek," is more descriptive of what occurred because the bulk of the creek figure is made up of mercury discharged to the creek as a normal part of the separation activity from 1955 to 1958. The mercury used in the lithium separation process was on 100% recycle. Impurities that collected in the mercury during processing were detrimental to the operation, so the

mercury had to be purified periodically. Initially, during the 1956-1958 time period, purification was accomplished with a wash solution of water and nitric acid. The solution was initially 5 percent nitric acid, which was later lowered to 3 percent. The acid dissolved the impurities, as well as some mercury. The purified mercury was returned to the process, and the wash solution (including the suspended quantities of dissolved mercury) went to a holding tank within the building, which pumped to a sump outside, which emptied into Upper East Fork Poplar Creek. Since production quantities of mercury were used in the process, significant quantities of mercury were transported to the creek by means of this cleaning operation from August 1956 through June 1958. Mercury discharges to the creek from this source were essentially eliminated when the nitric acid wash purification procedure was abandoned in 1958 and 1959 in favor of a water and air procedure that oxidized the undesirable impurities. The water utilized in this procedure was filtered and reused. This decrease in mercury discharges is depicted graphically on Exhibit 2, "Mercury Losses to East Fork Poplar Creek."

Another factor in decreased mercury discharges to the creek was the construction of New Hope Pond in 1963. The intention of the pond was to provide a gathering basin where discharges from the plant could be collected in order to smooth out the fluctuations in the acidity and alkalinity of the plant's discharges. For this reason, a discharge system to feed the pond was developed, which allowed for multiple inlets and improved the mixing of the storm

sewer and plant effluent material. The pond accomplished its intended purpose almost immediately, and the quality of the water discharged from New Hope Pond into East Fork Poplar Creek was improved noticeably. A secondary benefit was that insoluble mercury (both in suspended material and as a metallic material discharged from the plant) was also retained by New Hope Pond and was allowed to settle out. Since New Hope Pond was placed in operation in 1963, analyses indicate that 15,000 pounds of mercury have been retained in the sediments. About 6,500 pounds of this material was dredged out in 1972 and placed in a dry retention basin on top of Chesnut Ridge. The other approximately 8,500 pounds remains in the pond and will be disposed of when the pond is cleaned out. We submitted plans for cleaning out New Hope Pond to the State and EPA on July 1. We expect the work to be completed in the 1984-1985 time period.

SPILLS

Whereas most of the mercury discharges to the creek were the result of the process procedure, a larger quantity of material was lost through spills to the ground during mercury operations at Y-12. During our recent data gathering activities, we have found additional information that causes us to increase the spill quantities set forth on pages 8 and 9 of the 1977 Report. In addition to getting a better grasp on the magnitude of the losses, we have determined that there are additional spills that should be included, and that one of the dates was wrong by more than a year.

Before talking times and amounts, it may be helpful to discuss procedures for spill control. The operation of the lithium production plants involved the pumping of tremendous volumes of lithium-mercury amalgam. This required the development and operation of pumps of a type that were being used for the first time. Small leaks and spillages of mercury and amalgam were common, and the high rate of equipment failures and attendant maintenance problems increased the spillage of these mercury materials. The production buildings, therefore, were designed with a collection system to allow the mercury that spilled onto the floor to go into the building's drain system, and then to be trapped in tanks on the lower levels of the building. This collection occurred before the wash waters were drained to the outside sumps, and then to the environment. Notwithstanding these protective measures, there were a number of accidental spills to the ground during the course of the operations.

In addition to the five spills that are referred to in the 1977 Report for the production plants, we should include a figure for losses from the pilot plants, which operated from 1950 through 1955. We believe there were three spills at these plants during that time, with an estimated total spill quantity of 100,000 to 120,000 pounds, and an estimated loss after recovery operations of 95,000 pounds. The spills were the result of a ruptured valve, a split pipe and a failed pump. In each instance, the spilled mercury seeped through the floor into the dirt basement. Recovery operations were largely unsuccessful because the mercury kept running deeper into the ground during the excavation operation.

With regard to the production plant spills, our additional data gathering has yielded the following information:

<u>Date</u>	<u>Location</u>	<u>Estimated Quantity Spilled (lbs)</u>	<u>Estimated Unrecovered Loss (lbs)</u>
Jan. 1, 1956 (Not 12/31/55)	9201-5 (Alpha 5)	113,000 - 170,000	70,000
July 17, 1956	Ramp North of 9201-5	22,500 - 90,000	85,000
Summer 1956	Between 9204-4 (Beta 4) and 9201-5	22,500 - 90,000	85,000
Nov. 15, 1956 (Not Summer 1955)	9201-5	22,500 - 45,000	40,000
Mar. 28, 1966	9201-5	<u>105,000</u>	<u>49,853</u>
Total		285,000 - 500,000	329,853

Adding the production plant spill estimate of 329,853 pounds to the pilot plant spill estimate of 95,000 pounds I just discussed, the total of all spills at the pilot and production plants is estimated to be 424,853 pounds of mercury. This is a substantial upward revision of the 150,000 to 225,000 pounds estimate of the sum of unrecovered mercury that appears on page 10 of the 1977 Report.

The natural question, when faced with an estimated spill loss this large, is "Where did it go?" Based on presently available information--and I stress "presently available" because of the information gathering activities that we are going to be engaged in over the coming months--it appears that the bulk of the spilled mercury that was not recovered is deposited in the ground beneath Y-12. I am informed that the physical and chemical properties of

mercury--an element 13.6 times heavier than water, and a very mobile liquid between the temperature ranges of -38.87°C to 356.72°C (-37.97°F to 674.10°F)--make its pathway in the ground difficult to trace and its recovery impractical in the Y-12 geological formation. This formation consists of fractured, cavernous shales and limestones of the Conasauga group, found throughout East Tennessee. The most probable location of mercury accumulations is in permeable zones in the fill and open fractures in bedrock. In this formation, big holes abound that dip downward at about a 30° angle, resulting in gravity transport of any liquid. These holes are difficult to locate, even by intersectional drilling. Mercury from this source is reported to be quite unlikely to find its way into East Fork Poplar Creek or another waterway. There has been no evidence found to indicate interaction of the mercury spilled to the ground with any surface or groundwater, other than as the result of a recent water line break that I'll discuss later. We are, however, continuing to study the situation and are at the beginning stages of a drilling program to identify any mercury accumulations and any mercury contamination of groundwater in the Y-12 area.

SUMMARY OF MERCURY ACCOUNTABILITY

Before proceeding to what we are doing about the mercury situation today, let's recap where we are from the standpoint of the amount of mercury about which we're talking. The total amount of mercury used in the process is still classified, for national

security reasons, but we know there were spills, discharges, losses and what is identified in the report as "material unaccounted for."

The 1977 Report estimates that 2.4 million pounds of mercury has either been lost or is unaccounted for. As we discussed earlier, we believe a better estimate of losses, discharges and spills (in round figures) is as follows:

Lost to Air	51,300
Discharged to Creek	220,000 - 470,000
Lost to New Hope Pond	15,100
Spills	<u>425,000</u>
Total	711,400 - 961,400

To this should be added approximately 3,000 pounds for losses from Building 81-10, discussed on page 8 of the 1977 Report. This brings the total to 714,400 - 964,400 pounds of mercury estimated to have been lost to the environment, primarily in the 1955-1958 time period, as contrasted with the approximately 650,000 - 725,000 pounds estimated in the 1977 Report.

Using the 2.4 million pounds figure from the 1977 Report, subtracting the estimated losses to the environment leaves a balance of 1.5 - 1.7 million pounds unaccounted for. The 2.4 million pounds, however, is troublesome as a starting point because, it will be recalled, we are not certain how much mercury was received from GSA because, as best we can determine, the mercury was never

weighed. The DOE audit verification indicated that a range would better reflect the uncertainty surrounding this value. ORO's current estimate of total material lost or unaccounted for is 2.0 million to 2.6 million pounds, which means that, after subtracting losses to the environment, the material unaccounted for figure is in the range of 1.1 to 1.9 million pounds.

My charge to the DOE auditors in beginning their task was to independently review and verify all available mercury accountability information, to satisfy themselves that the figures are as accurate as DOE can obtain. They have done this, but some of the figures must continue to be expressed in ranges.

In short, though, we will probably never be able to account for all the Y-12 mercury inventory--if, for no other reason, because we are not certain how much was received at Y-12 and there is no real way to improve on our estimates. This uncertainty must, for the present, remain as an open question. Perhaps the activities of the Interagency Task Force under the MOU, or the other activities of ORO that are continuing, will eventually develop data that will help reduce the accountability uncertainties. In any event, the figures are sufficiently large to be a cause for concern. Because of our concern for the environment and the public health, ORO has concentrated its efforts on determining how much mercury was lost to the environment, what remains in the environment today and what is the effect of the mercury in the environment. This information will help us determine what actions are appropriate in response to the present situation.

ENVIRONMENTAL SAMPLING

One of the primary ways of determining what was released to particular parts of the environment, and what its potential effects are, is through environmental sampling.

To address the concern that local citizens rightfully have had about the mercury situation, for the past six weeks we have responded to citizen requests made to the City of Oak Ridge for soil, water, air and garden samples. We have also expanded our environmental monitoring program for mercury and other potentially hazardous substances in the Oak Ridge area. Before addressing the new sampling data, it may be helpful to look at the historical data.

With regard to East Fork Poplar Creek, which flows from the Y-12 Plant for approximately 20 miles to its juncture with Poplar Creek, and then to the Clinch River, we have performed mercury sampling over roughly the last decade in sediment and fish. Water sampling activities extend back to the mid-1950's. DOE first became aware of the presence of mercury in the sediments of East Fork Poplar Creek, and thereby the potential for uptake by fish, in the summer of 1974. Pursuant to a creek study plan, DOE gathered samples that showed elevated levels of mercury, as well as the expected elevated levels of uranium, thorium and PCB's. Fish sampling by Union Carbide in May, June, July and October 1976 showed elevated levels of mercury in some fish. The fish data was shared with TVA and the State of Tennessee in May of 1977. We have

also shared subsequent supplementary fish and sediment data. As I indicated in my earlier testimony, questions have been raised about the amount of information we furnished other agencies in this time period. Our continuing inquiry is examining whether information was withheld from other agencies.

The elevated levels of mercury in sediment and fish are believed to be the result primarily of the 1955-1958 discharges to East Fork Poplar Creek, which are believed to have deposited mercury into sediment along the full length of the creek bed and into the Clinch River. The portion of the mercury that was in insoluble form would have tended to settle out in nearby portions of the creek as well as moving further downstream, while the soluble form would be expected to have moved further downstream. Monitoring has been performed in the upper reaches of East Fork Poplar Creek since 1951. A monitoring station has existed at the outfall from New Hope Pond to East Fork Poplar Creek since it was constructed in 1963. I have included in my testimony as Exhibit 3 the mercury data generated by these monitoring activities since 1954.

Some representative sampling results for East Fork Poplar Creek and the Clinch River are:

Sediment (Background in local streams is 0.3 ppm, on average)

Highest Sediment	480 ppm (Off Illinois, near Turnpike)
East Fork Poplar Creek (close to Clinch)	19 ppm
Poplar Creek	51 ppm
Clinch River	7.8 - 18.5 ppm

Water (The Tennessee Stream Guideline is 0.05 ppb unfiltered for fish and aquatic life. The EPA National Interim Primary Drinking Water Standard is 2 ppb filtered.)

Outfall New Hope Pond (Y-12)	3 ppb Unfiltered
	1 ppb Filtered
Poplar Creek (near Clinch)	1 ppb Unfiltered

Fish (The FDA Guideline is 1 ppm in edible tissue.)

Blue Gill - Near Plant	2.13 ppm
- Close to Clinch	0.50 ppm
- Clinch	0.50 ppm

I have attached as Exhibit 4 to my testimony 1982 fish data for East Fork Poplar Creek, Bear Creek, Poplar Creek and the Clinch River.

Additional sediment, surface water, air and soil sampling in the Oak Ridge area in the last two months has yielded additional data, which I have attached as Exhibit 5 to my testimony. These data confirm elevated levels of mercury in some soils and sediment, no detectable mercury in air samples, and elevated levels of mercury only in water taken from East Fork Poplar Creek, not in wells, springs or tributaries to the creek.

With regard to whether the sampling data show violations of environmental standards or guidelines, there are no state or federal soil or sediment standards, per se. Air sampling data from the world's largest mercury mine in Almaden, Spain, and a former chlor-alkali plant in Virginia suggest no basis for assuming any Oak Ridge City area has the potential to exceed the Environmental

Protection Agency suggested guideline for ambient air. Air tested at Robertsville Junior High School, an area where one would expect dust to be kicked up, yielded no detectable airborne mercury. While the surface waters tested do not meet the present Tennessee Stream Guideline for protection of aquatic life, which has been reduced from 5 ppb to 0.05 ppb maximum mercury concentration over the past decade, it is hoped that our mercury cleanup activities within the plant and in New Hope Pond will bring the stream level down to the present Tennessee Stream Guideline. The surface waters do meet the EPA National Interim Primary Drinking Water Standard. Some of the fish sampled exceed the FDA action guideline for mercury in fish and, as I'll discuss later, appropriate actions have been taken.

MERCURY AT OTHER ORO PLANTS

In addition to the activities at Y-12 involving mercury, there were activities at about the same time period at the Oak Ridge National Laboratory and the Oak Ridge Gaseous Diffusion Plant that also involved mercury, though in much smaller quantities.

At the Oak Ridge National Laboratory, a small pilot plant supporting the OREX lithium separation process was operated from April until November of 1954 in support of the Y-12 weapons program. This pilot plant was located in ORNL Building 4501. At about the same time, component development work on the OREX process was conducted in ORNL Building 3592 for several months. In the early 1960's, there was also a small research and development effort in

ORNL Building 3503 in support of the fission reactor fuel reprocessing program that used a small amount of mercury.

The total mercury involved at ORNL was approximately 150,000-200,000 pounds and was obtained from the Y-12 inventory. There is no accurate measure of mercury loss at ORNL but operating personnel have estimated that a total of approximately 2,000-3,000 pounds was lost due to spills and leakage. This material is believed to have found its way to the ground under and around the three buildings housing the experiments.

Because of information showing mercury spills at ORNL, sampling was recently performed. The samples showed mercury in sediment values in White Oak Creek of up to 19 ppm, and up to 3.3 ppm in sediment in White Oak Lake. Levels in soil at ORNL range up to 320 ppm around buildings that once processed mercury. Available data, however, indicate that fish in the Clinch River at the mouth of White Oak Creek do not exceed the FDA action guideline for fish of 1.0 ppm. We are continuing to monitor the situation.

At the Oak Ridge Gaseous Diffusion Plant, a small distillation unit was operated from 1948 until 1971 to prepare pure instrument grade mercury. This process involved the purification of several hundred pounds of mercury per month. In the purification process, small quantities of mercury were discharged to a holding pond prior to discharge to Poplar Creek. In 1973, the holding pond was dredged and the mercury contaminated sludge placed in a holding pond without an outfall.

In the mid-60's approximately 90,000 of the Y-12 mercury shipping flasks were cleaned at ORGDP for return to Y-12. The flasks were subsequently used to drain Y-12 process equipment. During the cleaning process, small quantities of mercury were discharged to Poplar Creek.

There is no accurate measure of mercury process losses at ORGDP prior to 1971, but operating personnel have estimated that a total of approximately 1,500 pounds have been lost since 1948, with most of the losses occurring in the 1948-1971 time period.

CONCLUSION BASED ON MERCURY SAMPLING

Based on all the available information, there appears to be a consensus of regulatory and scientific personnel that the concentrations of mercury found in air, water, soil and sediment in the Oak Ridge area pose no immediate hazard to area residents. The main health concern is consumption of fish, which has been addressed by State activity. As a protective measure, the State of Tennessee posted East Fork Poplar Creek in November 1982 against eating fish caught there, based on data DOE furnished that showed mercury concentrations in some fish in the upper regions of the creek exceeded current Food and Drug Administration guidelines. We have assisted the State in its posting action by fabricating permanent metal signs with international symbols, based on a design provided by the State, that warn against fishing or swimming in East Fork Poplar Creek. Although we are of the opinion that only fish

consumption is an immediate health concern based on available information, we are pleased to cooperate with the State in this conservative approach to the situation. The Interagency Task Force established under the MOU will be examining the potential for any long-term effects of exposure other than from fish as a part of its analyses activities, and we will be participating in that study. As I mentioned earlier, we are pleased that the National Center for Disease Control will be offering advice on what further actions may be appropriate.

CURRENT AND PLANNED ACTIVITY

We have underway, or planned for the near future, activities that will enable us to continue assessing the Y-12 mercury situation or move toward its resolution.

We have just had completed two studies regarding mercury uptake. One experimental study, by the Oak Ridge Research Institute, was to research the biological significance of ingested creek sediment. Since Dr. Revis will be speaking later, he will address the results of the study, and I will only note that we are informed that the study showed no cause for health concerns based on acute ingestion of the sediment. Data from longer term chronic ingestion studies will not be available for approximately two years. The other study, performed by Battelle Columbus Laboratories, was a pathways analysis for the hypothetical scenario of a garden contaminated with sediments dredged from East Fork Poplar Creek.

The City of Oak Ridge has indicated that, since 1966, it is aware of three instances of the creek having been dredged. The City is not aware, however, of any citizens making use of the dredged creek sediments for garden use. Two of the City's dredging operations were quite small (150 cubic yards) and the material was utilized by the City for fill. The third dredging (450 cubic yards) was used as fill by contractors for the City along Emory Valley and Fairbanks Road. We have sampled these areas and the data are set forth in Exhibit 5.

Because of indications that some dredged material may have been taken without the City's knowledge and used on gardens as top soil, we commissioned Battelle to do an uptake study under varying conservative hypothetical situations, ranging from three half-ton pickup truck loads of material on a 40-foot x 40-foot garden upwards to a worst case that would require 606 half-ton pickup truck loads of material to cover a one-half acre garden three inches deep. We have no knowledge that any Oak Ridge citizen removed dredge material equivalent to even the minimum hypothetical amount, but we wanted to estimate whether there was any potential uptake at any concentration.

Battelle Columbus Laboratories analyzed the pathways for the highest and second highest levels of mercury, PCB's and radio-nuclides found in sediments for the complete set of scenarios and came up with the following results:

PCB's. EPA Allowable Daily Intake 210 micrograms/day

(Protective against non-carcinogenic effects, no-observable effects level)

Worst case 0.9% of standard.

Most Reasonable Case (100% of diet) 0.06% of standard.

(Risk of cancer incidence)

Worst case - About 1 in 10,000 lifetime risk.

Most Reasonable Case (100% of diet) - Less than 1 in 100,000 lifetime risk.

Radionuclides. The DOE/NRC dose limit is 500 millirem whole body.

Worst case 32.3% of standard.

Most Reasonable case (100% of diet) 2.2% of standard.

Mercury. World Health Organization Provisional Tolerable Level is 42.9 micrograms/day total Hg.

Worst case 197%

Most Reasonable Case (100% diet) 47%

These, of course, are hypothetical results based on the existing literature, which is quite limited with regard to the type and levels of mercury that exist at Oak Ridge. To obtain "real world" data and spot any potential problems, ORO has been sampling garden soils and vegetables of any individual who believes his or her garden contains East Fork Poplar Creek sediments. The first vegetable data is in and is set forth as Exhibit 6. Garden soil samples appear in Exhibit 5.

MEMORANDUM OF UNDERSTANDING

On May 26, 1983, we entered into a Memorandum of Understanding with EPA and the State of Tennessee, under which certain actions

will be taken and certain areas will be studied further. A copy of the MOU is included as Exhibit 7 to my testimony. Since Mr. Zeller of EPA and Dr. Bruner of the Tennessee Department of Health and Environment will be speaking shortly, I won't discuss the MOU in my testimony in any detail. I will state that the agreement is a tough one for DOE, but fair. It will require a heavy dedication of people and money to meet the dates we have set for ourselves, but we will work diligently to assure that the Y-12 Plant -- and other ORO facilities -- are brought into compliance with applicable standards as quickly as possible.

One of the activities that I have previously mentioned will be occurring under the MOU is an Interagency Task Force study of contamination in East Fork Poplar Creek and Bear Creek. The organizational meeting of the Task Force was held June 23, and was attended by representatives of the Department of Energy, the Environmental Protection Agency, the Tennessee Department of Health and Environment, the Tennessee Valley Authority, the Tennessee Wildlife Resources Agency, the U. S. Geological Survey, the City of Oak Ridge and its Environmental Quality Advisory Board, and other interested parties. The Interagency Task Force is not limiting itself to mercury, but will also be assessing potential stream contamination by plutonium, uranium, thorium, beryllium, PCB's and lead. The Task Force has not set a time schedule for completing its studies and arriving at conclusions regarding the appropriateness of any remedial action, and it may be two to three years before its activities are concluded. Thoroughness and proper action are seen

as being more important than speed, considering the lack of any immediate unaddressed health hazard, but we intend to press forward as quickly as possible consistent with a methodical and thorough evaluation of the situation.

There are two other actions mentioned in the MOU that we already had planned or underway. One is a hydrogeologic study of several waste disposal areas around the Y-12 Plant. This study, intended to provide information to assess site conditions around the disposal areas, to determine if groundwater contamination has resulted and to assess the need for and feasibility of corrective measures, will be looking for evidence of contamination by substances besides mercury, such as uranium and PCB's. The contractor, Law Engineering of Atlanta, is working on-site now, and the study results will be made available to the public, as well as the regulatory bodies, by the end of the year.

The other study, being performed by Union Carbide Corporation - Nuclear Division, is a history of waste disposal practices at the Y-12 Plant, and will include an inventory of waste deposited in various areas of the plant, to the extent possible. This will cover such substances as uranium contaminated materials, oils contaminated with PCB's, and other potentially hazardous materials. This study is expected to be completed by the end of January 1984, at which time we will release the report to the EPA, the State of Tennessee and the public.

One of the most troublesome problems at Y-12 mentioned in the MOU, in addition to the mercury contamination situation, is the S-3 Ponds. Since 1951, the four ponds, each one acre in size, have been receiving nitric acid wastes contaminated with low level enriched uranium, as well as aluminum nitrate, plating wastes, and miscellaneous lab acids and bases. Roughly half of the volume of material going into the ponds is mop water contaminated with beryllium and uranium. The ponds were constructed in the early 1950's as percolation basins, in accordance with contemporary design. They leak, and seepage from the ponds flows to Bear Creek and natural springs downgrade.

We are currently discussing with EPA and the State of Tennessee methods of handling S-3 Pond materials on an interim basis. The long term solution, however, is construction of the Central Pollution Control Facility (CPCF), which would process all of the effluents presently going into the S-3 Ponds. The funding for the CPCF has been an on-again, off-again situation, the off-again resulting primarily from a General Reduction of \$51 million in FY 82 appropriations for Atomic Energy Defense Activities, which resulted in agency withdrawal of \$5.4 million authorized and appropriated for the project. DOE, through its Albuquerque Operations Office, has identified methods of internally reprogramming funds to restore partial funding of the CPCF. Additional funding of \$2.4 million will be necessary to assure completion of construction of the line item project that includes CPCF. After construction of the CPCF,

which will take 3.5 years, the S-3 Ponds will cease to exist in their present form. We hope to award a fixed-price construction contract for CPCF by this fall. We have established that funding is available for this project in FY 83 and 84.

We are also currently involved in internal activities designed to eliminate the relatively minor continuing discharges of mercury to East Fork Poplar Creek. We determined that some two ounces of mercury per day are routinely released from New Hope Pond in six to eight million gallons of water. In October 1982, we commenced a storm sewer-drain line sampling program that revealed that our mercury releases are basically chronic, with New Hope Pond acting as a mercury "sink." We have identified drain lines from the old process buildings that are chronic sources of mercury. Many drain lines were partially clogged with debris, which formed traps for metallic mercury. Mercury puddles were found in process building fan rooms, apparently leaking out of hollow walls where vapors may have condensed. We initiated an additional cleanup program, which included cleaning the drain lines and packaging sludges for sale to a mercury sludge processor. We expect to complete the cleanup effort this summer, and then evaluate the results.

As I mentioned earlier, we are in the process of finalizing an ecological drilling program for the Y-12 Plant to provide information on mercury lost into the soil under the lithium separation process buildings, looking for mercury deposits and groundwater contamination. A draft drilling plan was furnished to EPA, the State and the City of Oak Ridge for comment and we have now factored in those comments.

Two weeks ago, a water pipe burst under one of the former lithium isotope separation process buildings, causing approximately one million gallons of water to enter New Hope Pond through the storm sewers with quantities of mercury that the water had picked up from under the process buildings. It is estimated that 1-3 pounds of mercury entered East Fork Poplar Creek as a result of the break. This has caused us to concentrate additional attention on a different area of concern: the aged piping under the process buildings. A restoration project was already underway to replace certain water pipes but we are now reviewing the need for pipe replacement in addition to those covered by the project.

The mercury that has already moved to New Hope Pond will be removed when we clean out New Hope Pond and eliminate it as an NPDES discharge permit point. Plans for dredging New Hope Pond have been developed, and are being reviewed by the State of Tennessee and EPA. We hope to complete the dredging in 1984 or 1985. We have analyzed seven cores from the pond, and found those sediments to be non-hazardous under existing waste disposal regulations. We intend to conduct the dredging activities in accordance with the TDHE guidelines so there will be no impact to East Fork Poplar Creek.

RADIOACTIVITY

The three DOE plants in Oak Ridge have consistently operated within the radiation standards established by the Nuclear Regulatory Commission and EPA. ORO's dose impacts are assessed in terms of

tracing the air, water and food pathways. Those dose impacts have consistently been below the present 500 millirem dose standard that has been nationally and internationally established as providing a conservative margin of safety against adverse health impacts. The 1982 figure for total body dose to a "hypothetical maximum exposed individual" on the Oak Ridge reservation was 4.9 millirem, about one percent of the present allowable standard.

You are probably aware that EPA, on April 6, 1983, pursuant to Section 112 of the Clean Air Act, proposed a National Emission Standard for Hazardous Air Pollutants, a "NESHAP," for radionuclides. This proposed regulation would establish tighter limits for radionuclide air emissions from all DOE facilities than the standards under which we presently operate. Consistent with NESHAP's EPA has developed for chemical industry pollutants, the proposed radionuclide standard approaches control from the standpoint of installation of best available control technology, rather than the traditional health physics approach of "as low as reasonably achievable." The proposed standard is "10/30," 10 millirems to the body as a whole, 30 millirems to an organ, of the "hypothetical maximum exposed individual."

Based on EPA calculational methods, Oak Ridge National Laboratory and the Oak Ridge Gaseous Diffusion Plant should be in compliance with the proposed standard. The Y-12 Plant, however, based on EPA's calculations, would not meet the standard. This appears to be the result of the assumptions utilized by EPA in its

modeling of the Y-12 Plant. The EPA model assumed that all the radionuclides from the three Oak Ridge plants were emitted from one 10-meter stack at the Y-12 Plant, rather than recognizing that the Y-12 Plant has 50 stacks of all sizes spread over a one-half square mile area and that the three plants are separated by 8 to 10 miles. ORO is presently remodeling the Y-12 situation, using EPA's dispersion and dose calculation program but with more realistic assumptions. The results of the remodeling may show Y-12's ability to meet the proposed NESHAP. If not, our estimate of the cost to retrofit new control equipment is about \$20 million. Since the Clean Air Act allows a period of two years to achieve compliance with the NESHAP, if EPA's modeling proves correct and the standard is adopted as proposed, because of the combination of the Government's budget cycle and the time necessary to procure and install equipment, the Y-12 Plant would be out of compliance with the new standard for a couple of years.

On the subject of radioactivity, early ORNL burial grounds and pits leak radioactivity to surface streams in the ORNL area. In fact, the disposal pits and trenches in use until about 10 years ago were designed to allow seepage of liquids through soils where most of the radioactivity was removed -- as through a filter. All of this seepage is monitored and combined with other waste streams which pass over White Oak Dam. As noted in our annual environmental monitoring reports, radioactivity levels meet permissible standards at that point. Nevertheless, we have considered even these releases to be undesirable and have had a program under way for over five

years, at about \$1 million per year, to further reduce these releases. This is done by reducing the amount of rainwater which gets into the trenches and pits, through construction of diversion ditches, and better sealing over the top of the pits and burial grounds.

PCB's

Because of the nature of the Oak Ridge plants, having used huge electric motors for four decades, and because until recent years transformers serving electrical equipment used polychlorinated biphenyls, ORO has a large volume of radioactively contaminated PCB's, as well as other radioactively contaminated waste. Our intent, as indicated in a June 1982 Environmental Impact Statement entitled "Incineration Facility for Radioactively Contaminated Polychlorinated Biphenyl and Other Wastes," is to construct an EPA approved PCB incinerator that will be able to safely and almost totally destroy PCB's and other organic chemicals. This facility, expected to cost \$33 million, is scheduled for completion in 1988. It will be built at the Oak Ridge Gaseous Diffusion Plant, but will serve all the facilities under Oak Ridge Operations.

ORNL ENVIRONMENTAL SITUATION

Looking at environmental concerns at Oak Ridge National Laboratory other than mercury, it is important to recall that what is now ORNL was created in 1943 with an urgent wartime mission to

operate the world's first fission reactor for the production of plutonium, and to develop chemical techniques for the recovery and refinement of that plutonium. While that wartime mission and the follow-on missions of the Laboratory were conducted in a manner to afford maximum protection to workers and the environment, consistent with the standards of the day, techniques for measurement and control of radioactivity and chemicals were not as sophisticated then as they are today. As a result, there exist at ORNL many old sources of pollution that require continued attention and upgrading as improved environmental techniques become available. The focus has been on mitigating the environmental impacts of these early potential sources of pollution and in assuring that current operations are provided with state-of-the-art measurement and controls.

With regard to specific problems, early liquid low level radioactive waste operations at ORNL involved a variety of tanks, settling basins and seepage pits for the reduction of radioactivity releases. White Oak Lake, a man-made structure on the Oak Ridge reservation, was used as the final mixing and settling basin for radioactivity and it remains significantly contaminated today.

Solid radioactive wastes from ORNL and from other eastern U. S. nuclear sites (from the time when ORNL served as the southeast regional burial ground) have been disposed of in shallow trenches in six low level solid radioactive waste burial grounds at ORNL. Many of the old basins, pits and trenches have seepage to groundwater in

the ORNL area. As I mentioned earlier, this seepage and leakage reaches branches of White Oak Creek, where it is monitored prior to release to the environment at White Oak Dam. As I indicated, these effluents meet applicable standards at that point. Approximately \$50 million has been spent in the past 10 years in the continuing effort to improve radioactive waste operations at ORNL.

In addition to radioactivity, ORNL operations have involved a broad variety of chemicals and, of course, ordinary sanitary waste. Many of the chemicals were used on relatively urgent missions or at a time when controls and toxicities were not so clearly understood as they are today. The sewage plant at ORNL is very old and outdated, has significant rainwater inleakage and, as a result, is overloaded and the source of continual violations of the NPDES permit. We have a \$1.4 million project authorized for FY 84 which will correct this problem.

Runoff from the ORNL coal storage area currently exceeds EPA standards. Many corrective measures have already been taken, and these will be completed in FY 84.

This is, admittedly, a very brief overview of the past and current environmental status of ORNL's very broad and complex research and development operation, with several potential sources of environmental releases. The main point that should be understood is that we continue to take very seriously the matter of identifying

the significant sources of potential environmental concern from past and current ORNL operations, and we are continuing to institute corrective measures.

ENVIRONMENTAL SITUATION AT ORGDP

We are pleased with the present environmental situation at the Oak Ridge Gaseous Diffusion Plant, and believe that ORGDP has resolved most of its major environmental concerns. That is not to say, however, that there are not still problems being worked.

In the early days of ORGDP the K-1407B Pond was constructed to provide settling and equalization for flows from the plant uranium decontamination and recovery operation. Later, effluent from cleaning areas in the maintenance facility were also directed to this pond. These flows were neutralized and the precipitate settled in the pond. More recently, coal pile runoff from the neutralization system has been diverted to this pond.

In the 1970's, a new pond, known as 1407C, was built to receive material from the dredging of 1407B. Some classified precipitates have also been added to the 1407C pond.

The sediments in the 1407B and C Ponds present a disposal problem, and there is an FY 1986 project to fix these sediments in concrete for proper disposal. A pond will also be built to receive the coal pile runoff and segregate it from the radioactive materials

in 1407B. It is presently in the engineering stage. It should be noted that monitoring wells in the area of the ponds show no evidence of leakage.

During past operations, quantities of uranium were discharged to Poplar Creek and were measured by routine sampling. Some PCB's were probably also discharged, in addition to the mercury previously discussed. It is planned that the Interagency Task Force study under the MOU will consider these contaminants.

A large quantity of scrap metal, slightly contaminated with uranium, is stored in the old Powerhouse area. This material, the result of past plant upgrading and uprating operations, is stored in the flood plain of the Clinch River. Efforts are presently underway to have the scrap reduced in size so that it will be suitable for smelting.

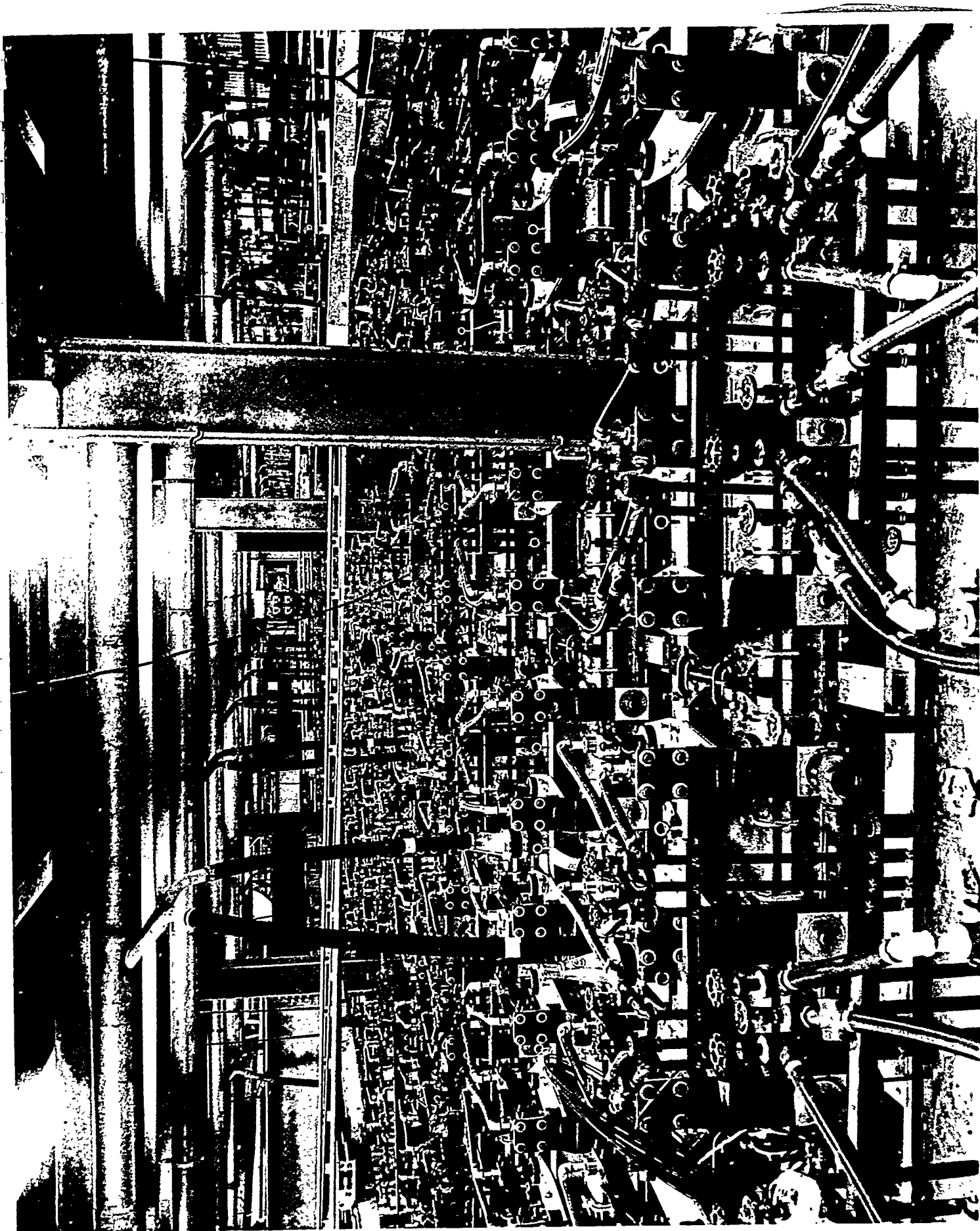
The NPDES permits for ORGDP expired in 1980, but were extended by EPA, pending renewal. Requests for renewal have been submitted, along with considerable sampling data.

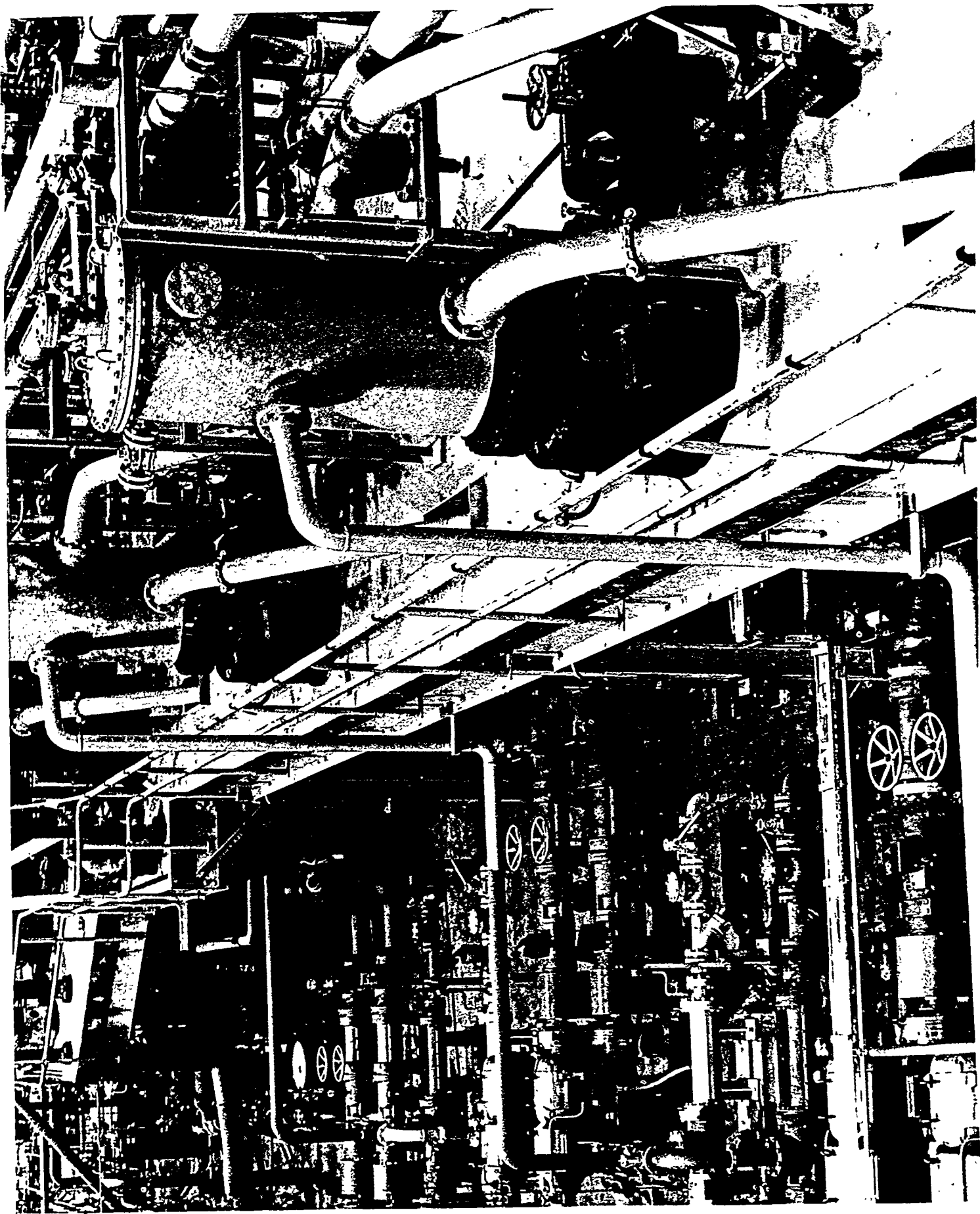
CONCLUSION

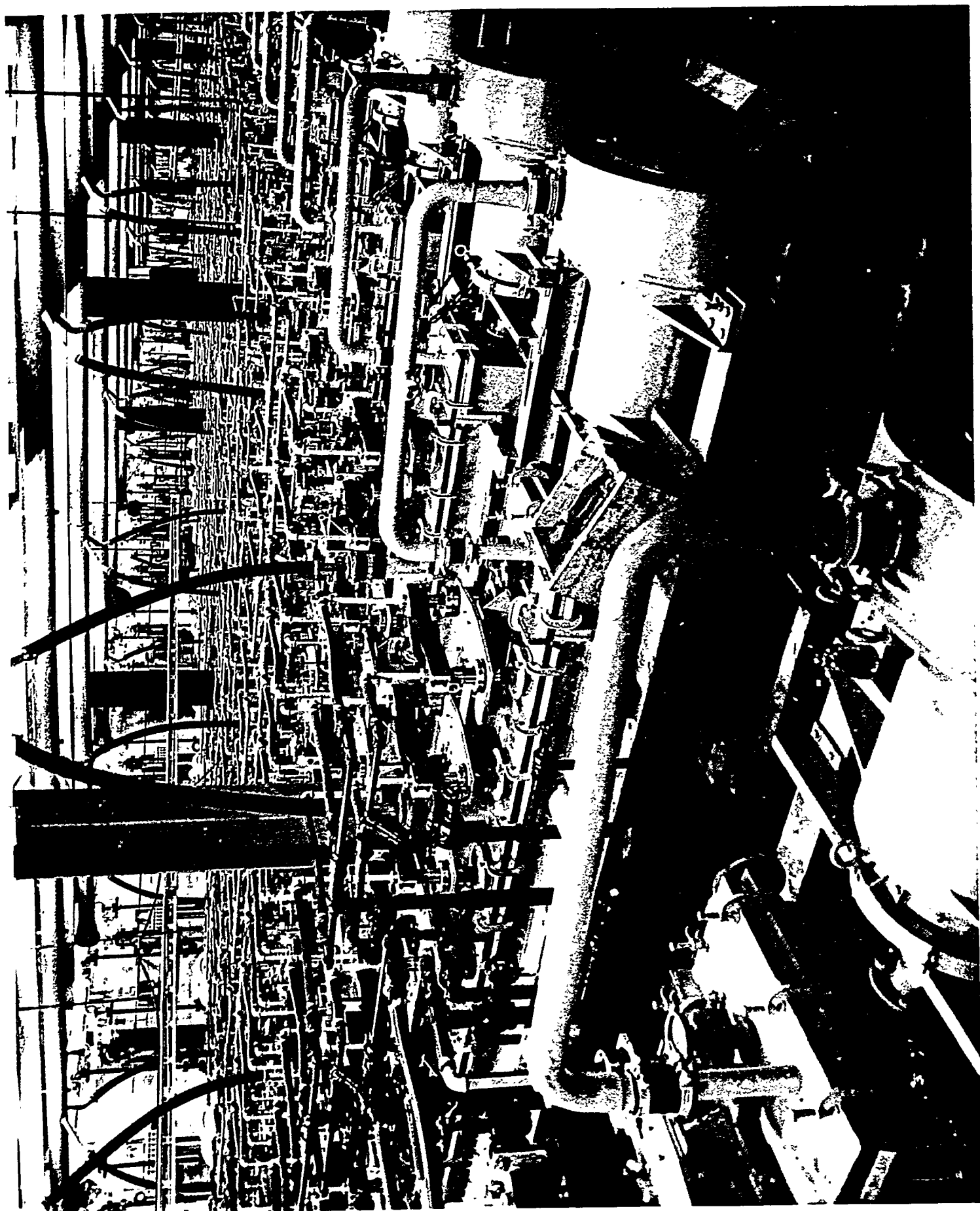
If two things come through loud and clear from my presentation today, I hope it is this: First, because of the age of its facilities and its history of being on the forefront of national

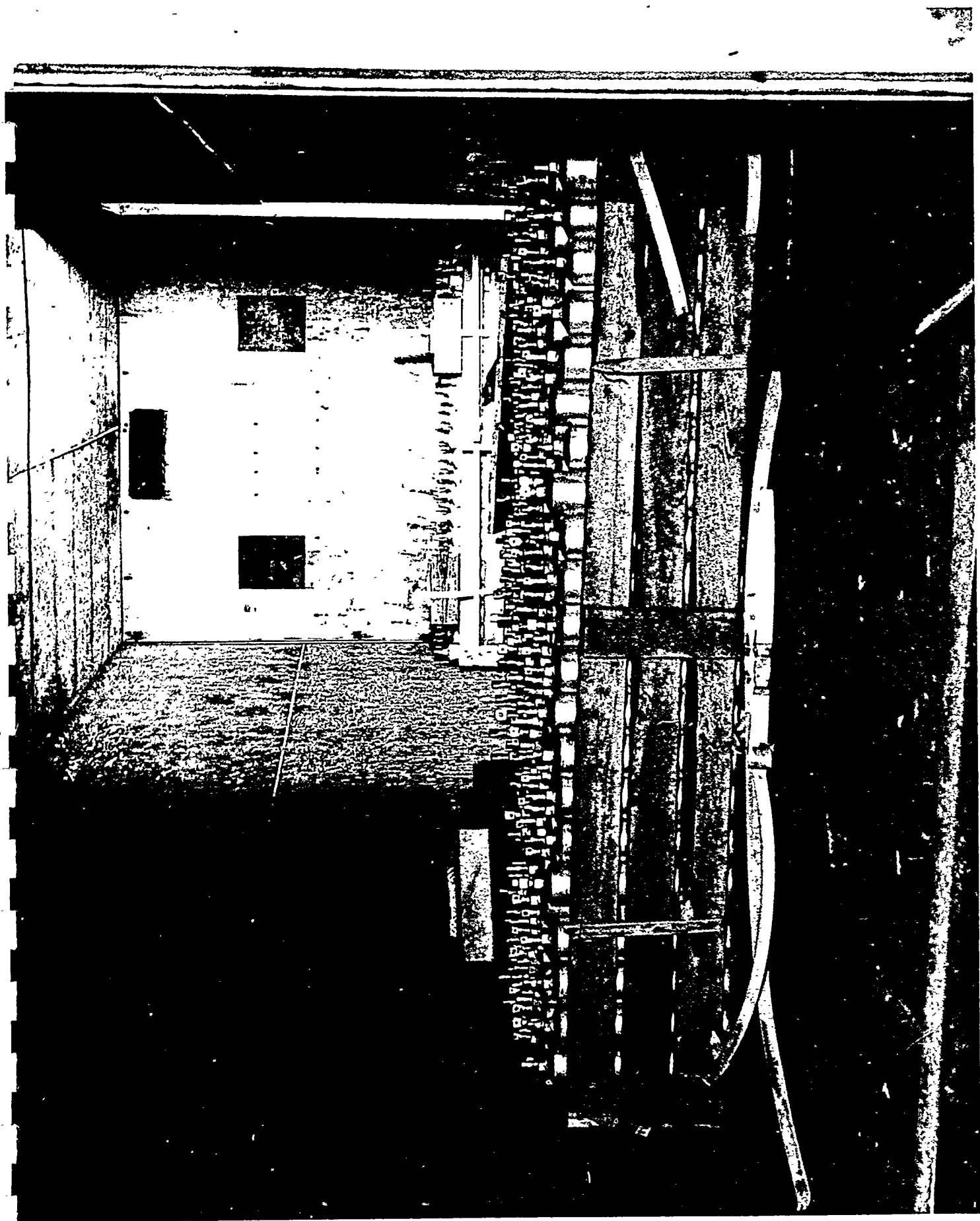
security activities, ORO today has some environmental problems. Second, we are working diligently, with openness and candor, to identify and control those problems, and to bring our facilities into compliance with applicable standards. With the continued assistance of the Environmental Protection Agency, the Tennessee Department of Health and Environment, the City of Oak Ridge, the fine citizens of this area ... and the Congress ... we will be successful in our endeavors.

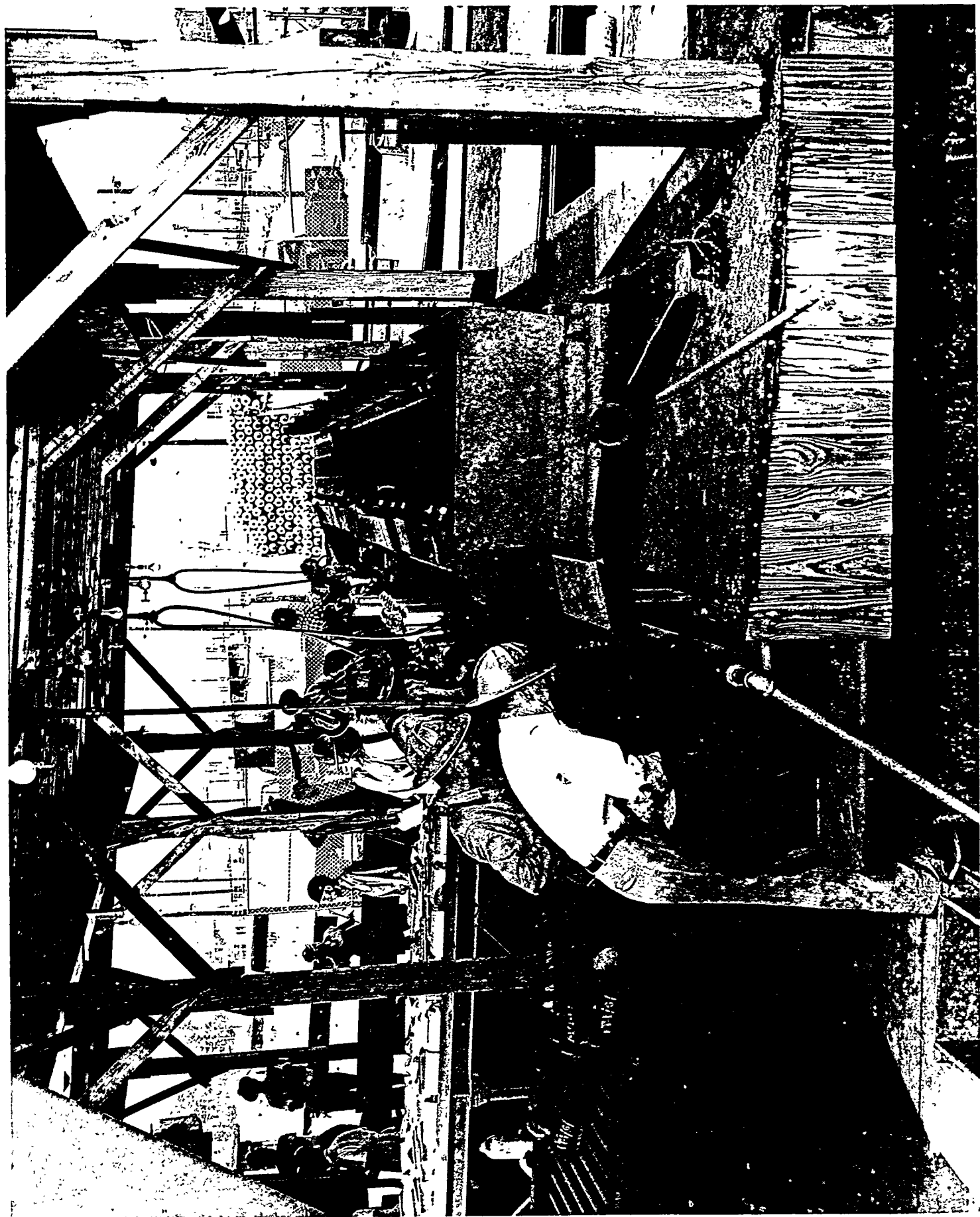
That completes my statement. I would be glad to answer any questions you may have.













UNION CARBIDE CORPORATION

NUCLEAR DIVISION

P. O. BOX Y, OAK RIDGE, TENNESSEE 37830

June 9, 1977

United States Energy Research and Development
Administration, Oak Ridge Operations
Post Office Box E
Oak Ridge, Tennessee 37830

8724

Attention: Mr. H. D. Hickman


Gentlemen:

UNCLASSIFIED VERSION OF
Mercury Inventory at Y-12 Plant 1950 through 1977

Attached is the information you requested regarding mercury releases in the Y-12 area. Also attached is additional information to support this mercury review.

Please let us know if further information is desired.

Very truly yours,


for J. M. Case, Plant Manager
Oak Ridge Y-12 Plant

DWS:jai

Attachments: "Solvent Losses through
Ventilation Exhaust Systems, Bldg.
9201-5" (C)
"Estimated Mercury Losses in Creek
Waters 1955 through 1975" (OUO)

Distribution, Series A:

Copies 1-5: H. D. Hickman
6: D. J. Bostock (Y-12RC)
7: J. M. Case
8: R. F. Hibbs
9: R. G. Jordan
10: J. D. McLendon
11: C. J. Parks
12: R. D. Williams

Distribution, Series C:

H. D. Hickman, DOE-ORO

Exhibit 1

June 9, 1977

SUMMARY

The Y-12 Plant was involved with the handling of production quantities of mercury from 1950 through 1963. The maximum inventory in the Plant was during 1956-1957

Deleted 2.4 million pounds has either been lost or is material unaccounted for.

Known losses are:

1. Airborne losses
2. Creek losses
3. Recorded spills
4. Deliberate overage in bottling of Y-12 mercury for GSA

Material unaccounted for:

1. Salvage still in 9201-4
2. Anticipated overage in 9201-4 inventory
3. Mercury carried out on equipment during 9201-5 stripping operations
4. Mercury retained in the extract or "tails" material during lithium processing
5. Probable shortage of mercury in the original inventory when the system was charged by Rust Engineering Company

The majority of the mercury which was released to the environment occurred during early operations of the Colex Process, 1955 through 1958. This material was discharged either to the air, lost to the creek (approximately 230,000 pounds), or lost in the earth.

The airborne losses were reduced to practically zero in 1958. The creek losses have been less than the minimum detectable limit since 1963. There have not been any earth losses reported since operations were terminated in 1966.

Current practices and procedures for the bottling of the existing inventory minimize the possibility of any creek or earth losses. Air losses continue to be minimal. Processes are being developed to prevent the loss of any mercury when the remaining process equipment is washed and stripped from Building 9201-4.

CONCLUSIONS

1. Based on the past ten years data, it appears in the future the creek losses will not exceed the drinking standard for water.
2. In comparing loss data at the source (9201-4 and 9201-5) and the creek data leaving Y-12 with the approximate or actual date of known losses to the earth, there is no evidence that these ground losses had or have reached Poplar Creek.
3. Based on the water quality leaving Y-12 in the past 14 years by effluent sampling, it is concluded that losses to the earth are contained in the shale beneath the spill locations.
4. If the soil from the creek were excavated in a strip 20 ft. wide, 20 miles long, and to a depth of 12 inches, it would totally destroy the creek and would remove less than 4,000 pounds of mercury.
5. After inspection of all identified spill locations, it is felt that no further excavation is warranted.

RECOMMENDATIONS

1. It is recommended that monitoring for total soluble mercury in the east fork of Poplar Creek be continued.
2. Limited data on soil samples are available from the east fork of Poplar Creek. It is recommended that soil samples be taken on an annual basis to determine the rate in which the soil in the creek is being purged of mercury.
3. It is recommended that soil samples be taken in future major excavations of areas that had large quantities of mercury used and/or lost. This would determine if salvage operations are warranted.
4. A survey was made of mercury processing areas, known mercury spill locations, and the mercury storage area with the following recommendations being made:
 - a. 81-10 - Visible mercury should be cleaned up and the mercury trap and settling basin cleaned.
 - b. 9201-5 - One small area contaminated with mercury was found. This will be cleaned up.
 - c. Increase clean-up activities in the Feed Prep./Extraction and the Evaporator areas. Drain equipment and pipe lines in the same manner that the cascade equipment is being emptied. This will leave the entire building in a "drip free" condition until final stripping is initiated.

June 9, 1977

- d. Mercury storage (Building 9720-26) - No changes are recommended.
- e. 9201-2 - The basement area of this building was examined in those areas where known spills and excavation had taken place. No visible mercury was seen.

June 9, 1977

INVENTORY BALANCE

Total mercury received in Y-12

Bottled prior to 1977

Estimate of overage when filling bottles¹Estimate of material removed in 9201-5 stripping²

Recovered by Mallory Battery Company

Estimate from decommission of facility

Mercury in extract produced³

Book inventory 9201-4 December 31, 1976

Estimated inventory error⁴Estimated hold up in 9201-4 salvage⁵Estimated hold up in 9201-4 equipment⁶

Total estimated 9201-4 inventory

Measured loss 9201-5 March, 1966

Creek losses through 1972⁷ (soluble)Creek losses through 1964⁸ (entrained, estimated)Mercury in sludge removed from New Hope Pond⁹Airborne losses 1955 through 1963¹⁰

Total mercury accounted for

Total mercury unaccounted for

49,853

235,000

235,000

7,200

30,000

Deleted

1,880,699

¹Y-12 bottling procedure calls for filling bottles to 76 pounds ± 2 ounces²All equipment removed from 9201-5 had some mercury contaminationDeleted⁷Creek losses 1955 to present⁸No analysis available on entrained material. Estimated to be equal to soluble mercury⁹Average analysis of sludge removed from New Hope Pond¹⁰Letter J. C. Little to distribution dated March 4, 1956

June 9, 1977

HISTORY

1. Development and Pilot Facilities

- a. Building 9733-2 - Development facility for the Elex Process (Electrical Exchange). Operated 1950 and 1951.

Mercury Inventory Deleted

Effluent control - This facility had a steel sump or trap installed in the floor drain system before entering the storm sewer. This trap was routinely checked and emptied. This system was incorporated on all of the future development and pilot facilities. Except in the event of gross spills, it proved effective in preventing metallic mercury from entering the creek.

Losses - There were no major losses reported.

- b. Building 9733-1 - Development facility for the Orex (Organic Exchange). Operated 1951 and 1952.

Mercury inventory - Deleted

Effluent control - Same as 9733-2.

Losses - There were no major losses reported.

- c. Building 9201-2 - Pilot plant for the Elex Process and for the Colex (Column Exchange) Process. Operated September, 1951 through 1955.

Mercury Inventory - Deleted

This building housed several pilot plants and equipment test facilities over the four-year period and was Y-12's first involvement with significant quantities of mercury. During the operation of the different facilities there was a total loss of 108,000 pounds. Major recovery operations were conducted by excavation of dirt from the basement of this building. Visible mercury was collected from the dirt. The rest of the dirt was stored and later processed through the Nichols Hershoff furnaces at Building 81-10. At one time recovery attempts were made by manually digging at the storm sewer discharge to the creek. (N. K. Bernander). There was very little mercury recovered in this attempt.

Although there was a large amount of material unaccountable as a result of operations, there is no record of any one large spill that was lost to the environment.

- d. Building 9202 - Pilot plant for the Orex Process. Building operated April, 1953 through May, 1954.

Mercury inventory - Deleted

June 9, 1977

Operations in this building were of the same magnitude as the 9201-2 facilities. Estimated losses were 50,000 pounds. There were no major spills recorded; however, when a mercury inventory showed a significant loss and it had not been recovered in the trap outside the building, the storm sewer between the building and the trap was excavated and an attempt to recover the mercury was made. The dirt from the recovery operation was stored for later processing in the Nichols Hershoff furnace. (A. D. Ryan).

2. Production Plants

- a. 9204-4 Elex Production Plant operated 1953 through Spring, 1956.

Mercury Inventory ~~Deleted~~ At the end of the program, the inventory showed a loss of 71,000 pounds. The design of this operation reduced the probability of major spills. The majority of the process equipment was on the upper levels of the building and spills could be cleaned up before getting to the outside. There were occasional spills in the salvage recovery area in the basement, some of which could have been lost to the storm drain or to the earth through cracks in the floor.

- b. 9201-5 Colex Production Plant. Operated January, 1955 through February, 1959, and partial operations were resumed for a Lithium-7 production run in December, 1962 through May, 1963. The building was stripped of process equipment in 1965 and 1966.

Original design provided ~~Deleted~~ settling tanks to collect process overflows to prevent loss of mercury to the creek. The system was soon modified to also catch all of the building floor drains. All building effluent was pumped to a neutralizing sump south of the building where it was periodically pumped to the storm sewer. Development studies resulted in minimizing the flow to this sump and using it as a settling basin with a continuously monitored overflow.

During the initial building startup, there were numerous mercury and amalgam spills in the building. Although the volume of the spills was not recorded, recovery operations were considered to be effective but it must be assumed that mercury was lost both to the ground and to the storm sewer system.

There were three known spills of mercury on the ground outside of 9201-5 and two major spills inside the building during this period where mercury is known to have been discharged to the environment. These will be discussed in detail later.

- c. 9201-4 Colex Production Plant. Operated June, 1955 through December, 1962. The design of this building was similar to that of 9201-5. Process and waste treatment improvement parallel those in 9201-5. The major auxiliary operations (Feed Prep., Extract, and Evaporation) for both buildings were conducted at 9201-4.

June 9, 1977

There were no reported major spills to the environment at this building. Process spills and leaks were similar in nature and magnitude as those in 9201-5.

- d. Building 81-10 - This facility was constructed in 1956 and 1957. Operations were intermittently from March, 1957 through May, 1962. This facility was designed to recover mercury from solid wastes by evaporation and condensation. The primary feedstocks for the facility were filter solids (both lithium carbonate and powdered graphite), decomposer graphite, floor sweepings, "sludge" (solids recovered from settling tanks), and contaminated dirt (from excavating outside or around spills).

Deleted. The facility was constructed on a concrete pad with the drains being collected in a concrete mercury trap. All of the effluent from this facility flowed through the trap to a settling basin before being discharged to the creek.

Losses to the surrounding area were experienced through cracks in the concrete, water leaving the facility, and airborne losses.

3. Spills

There were five major spills during the Y-12 operations where mercury was released to the environment. These are in addition to the losses reported for 9201-2 and 9202.

a. Summer, 1955

200-400 gallons (22,500 - 45,000 pounds).

Northeast corner, 9201-5.

Condition - Plugged decomposer,

Deleted

Recovery - Visible mercury shoveled off of ground (earth). Backhoes brought in to excavate. Drums of salvage dirt later processed at 81-10. (T. W. Robinson, G. W. Evans).

b. December 31, 1955

1,000 - 1,500 gallons (113,000 - 170,000 pounds).

South end of Crane Bay 6 (inside) 9201-5.

Condition - Ruptured expansion joint

Deleted

Mercury sprayed through south end of building.

Recovery - All visible mercury recovered inside building. Some mercury released through basement of fan room floor.

June 9, 1977

c. Summer, 1956

200-800 gallons (22,500 - 90,000 pounds).

Lost on ground at mercury dumping station.

Condition - Improper valving while transferring mercury from 9204-4 to 9201-4 and 9201-5.

Recovery - Visible mercury recovered by manually shoveling up surface dirt. Excavation by backhoes. The dirt excavated was stored in drums and later fed to Nichols Harshoff furnace at 81-10. (J. E. Smyrl).

d. Summer, 1956

200-800 gallons (22,500 - 90,000 pounds).

Lost on ground north of First Street at ramp entering 9201-5.

Condition - Improper valving while transferring mercury from 9201-5 to 9201-4.

Recovery - Visible mercury recovered by manually shoveling and vacuuming. Excavation by backhoes with dirt drummed and later fed to 81-10. (J. E. McNabb, W. H. Hubbs, D. W. Smith).

e. March, 1966

890 gallons (100,000 pounds).

9201-5 Fan Rooms E and F.

Condition - Leaky "sight glass" on storage tanks.

Recovery - Visible mercury recovered by vacuuming and sweeping

Deleted

Core drilled in basement to locate remaining mercury. No significant quantity was located.

This spill documented in United States Atomic Energy Commission report of investigating committee, "Loss of Mercury at the Y-12 Plant," dated 1966.

4. Losses

- a. Airborne losses - During operations, a maximum of 30,000 pounds have been lost as airborne losses. (Letter J. C. Little to distribution dated March 4, 1956). Calculated quantity is based on Alpha-5 operations of 400 days at 20 pounds/day and 1100 days at 5 pounds/day; Alpha-4 operations of 250 days at 20 pounds/day and 2200 days at 5 pounds/day.

June 9, 1977

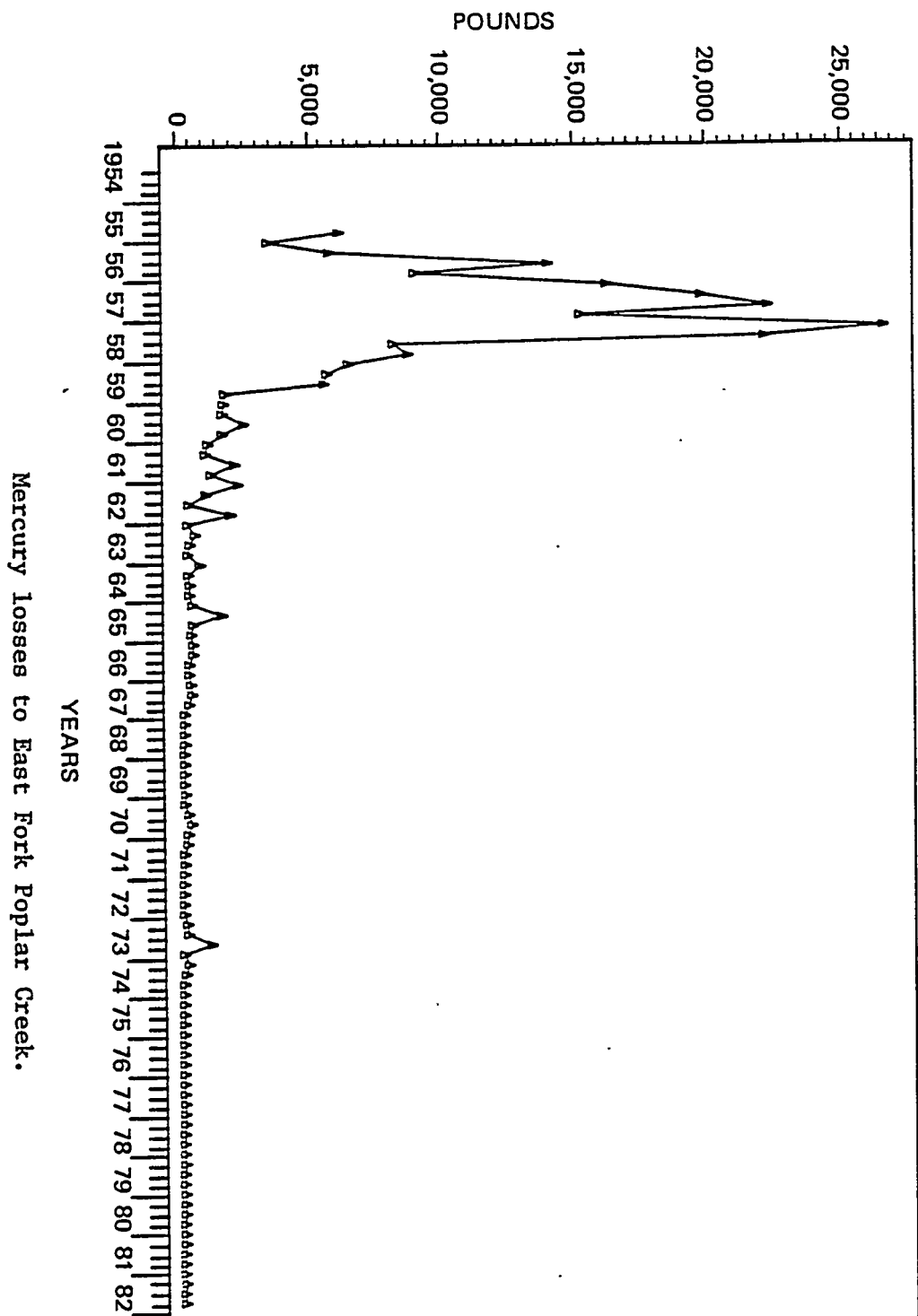
- b. Creek losses - Creek losses of mercury totaled 470,000 pounds through 1962, with an additional 5,000 pounds being lost through 1972. Since 1972, losses have been less than 18 pounds/year. (Letter J. M. Napier to D. W. Smith dated March 5, 1977).
- c. Spills - An estimate of losses to the earth is difficult to establish; however, from the inventory balance this loss could be as much as 1,880,699 pounds. The sum of unrecovered mercury from the five spills is estimated between 150,000 and 225,000 pounds.

INVENTORY SHORTAGE

During the charging of the Colex System (9201-4 and 9201-5) in 1955, Rust Engineering Company emptied Deleted flasks of mercury. This operation was done over a period of 6 to 8 months. Although the receiving vouchers showed the quantity of flasks received to be correct, there was some comment made at that time (undocumented) that some of the flasks were only partially full or empty at the time they were emptied.

It is felt that there was an initial inventory shortage at the time the system was filled; however, no finite number is being assigned for this shortage. The following evidence is offered to support this conclusion.

1. As early as 1958 when the first mercury was being flaked and returned to GSA leaky flasks were found. These flasks were discarded.
2. During storage, it was found that some of the accepted flasks (20-25 psi pressure test) were "leakers" and these were removed from Y-12 storage upon detection.
3. These flasks were the same ones that the mercury was received in and had been in storage throughout the world for an undetermined period.



MERCURY WATER ANALYSES
WATER SAMPLE RESULTS TAKEN FROM
EAST FORK POPLAR CREEK

WATER SAMPLE: E RESULTS TAKEN FROM EAST FORK POPLAR CREEK

(Mercury $\mu\text{g/L}$)

on

0.001 mg/L

from 1979 to Present).

[illegible]

WATER SAMPLE RESULTS TAKEN FROM EAST FORK POPLAR CREEK
(Mercury Mg/L)

1957-1973--Method of Analysis:

Mercuruometer
Limit of Error: + 40% at 0.1 mg/L

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1977	.0005	.0013	<.001	<.001	.001	.002	.0015	.003	.0015	<.001	.0049	.0028 .0026 .0028. .0034 .0037
1976	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
1975	.0011 .0020 .0015	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
1974	<.005 <.0005	<.005 <.1 <.0005	<.1 <.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005
1973	--	<.0005 <.1	<.005	--	<.005 .0006	.0003 <.1	<.1	<.0004 .001 <1.0	.0002 <.1	<.0005	<.0005	<.0005 <.0005
1972	<.001 .0002 <.001 .0030 .0005	<.001 <.001	<.001 <.001	.0007 <.0002 .0003 <.0005 <.001 <.0005 <.001 <.0005 .001	.0006 <.001 <.0005 <.001 <.0005 <.001 <.0005 <.001	<.0005 <.0005 <.0005 <.001 <.0005 <.001 <.0005 <.001	<.001 <.0005 <.001 <.001 <.001 <.001 <.001 <.001	<.0005 <.001 <.0005 <.0005 <.001 <.0005 <.001 <.001	<.0005 <.0005 <.0005 <.0005 <.0005 <.0005 <.0005 <.001	<.0005 <.001 <.0005 <.0005 <.0005 <.001 <.0005 <.001	<.0005 <.001 <.0005 <.0005 <.0005 <.001 <.0005 <.001	<.001
1971	<.001 <.001	.012	.039	<.015 <.001 <.001 <.001 <.001 <.001	<.01 <.001 <.001 <.001 <.001 <.001	<.01 <.0005 <.001 <.0005 <.005 <.005 <.001	<.01 .0025 <.0001 <.0001 <.0005 <.001	<.01 <.001 <.001 <.001 <.001 <.001 <.001	<.01 <.0005 <.001 <.0005 <.001 <.001 <.001 <.001	<.01 <.0005 <.001 <.0005 <.001 <.001 <.001 <.001	<.01 <.0005 <.0005 <.001 <.001 <.001 <.001 <.001	<.01 .0015 .0022 .0002 <.0005

MERCURY WATER ANALYSES

PAGE 3

WATER SAMPLE RESULTS TAKEN FROM EAST FORK POPLAR CREEK (Mercury Mg/L)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1970	<.01 <.001	.01 <.0002 <.01 <.0001	.01 <.0002 <.01 <.0001	.01 <.0002 <.0002 <.0001	<.01 <.1 <.001 <.0010	<.01 <.1 <.001 <.0010	<.01 <.1 <.001 <.0010	<.01 <.10 <.001 <.0010	<.01 <.1 <.001 <.0010	<.01 <.10 <.1 <.001 <.0001 <.001	<.01 <.001 <.001 <.0001 <.001	<.01 <.001 <.0001 <.0001 <.001
1969	<.01	<.01 <.0002 <.0004 <.0002	<.01	<.01 <.0002	<.01 <.0002	<.01 <.0002	<.01 <.0002	.01 <.0002	<.01	<.01 <.01	<.01	<.01 <.0002
1968	<.01 .0002 .0002	<.01 <.002 <.0002	.01	.01 <.0002	<.01 <.0002	<.01 <.0002	<.01 <.0002 <.0002	<.01 <.0002	<.01 <.0002 <.002	<.01 <.0002 <.0002	<.01 .0002	<.01 <.0002 <.0002
1967	.05 .05	.05 <.05	.01	.049 <.0002	<.049 <.05 <.05	<.049 <.05 <.05	<.049 <.0002	.049 .0002	<.01 <.05 <.0002	<.01 <.0002 <.0002	<.01	<.01 <.0002
1966	<.05	--	--	--	--	--	--	--	--	<.05	<.01	
1965	<.05	<.05	<.05	<.05	.4115	<.05	<.05		.05	<.05	<.05	
1964	.034 .33 .010 .026 .006 .11	.011 .12 .31 .10 .032	.015 .05 .022	.013 <.05 <.050 .010 .010	.004 .013 .013 .021 .05	<.05 .008	.027		<.05	<.010	<.05	.05
1963	.016	--	--	--	--	--	--	--	.015 .022 .030 .043 .043 .015	.017 .033 .004 .014 .004 .004	.054 .014 .021 .014 .017 .033	.09 .06

MERCURY WATER ANALYSES

PAGE 4

WATER SAMPLE RESULTS TAKEN FROM EAST FORK POPLAR CREEK (Mercury Mg/L)

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1962	--	.28 .34 .16	.26 .21 .13 .20 .06	.16 .12 .16	.10 .27 .04 .01	.06 .01 .05 .02 .01	.01 .02 .03 .003	.02 .01 <.01 <.01 <.01	.01 .04 .04 .06	.06 .03 .04 .03	.06 .20 .06 .08 .01	.06 .10 <1.0 <1.0
1961	.05 .20	.07 .16 .28 .04	.16 .10 .09 .18	.20 .15 .10	.12 .10 .09 .07	.06 .09 .07 .08	.26 .08 .05 .16	.36 .08 .17 .33	.42 .10 .18 .29 .51	.32 .11 .08	.10 .15 .13 .09	.09 .12 .05 .08 .10
1960	.18 .04 .16 .24	.09 .17 .18 .14	.05 .51 .29	.23 .24 .34 .13 .23	.16 .12 .18 .12	.21 .19 .15 .27	.15 .16 1.99 .14 .13	.23 .18 .16 .09 .14	.12 .14 .33 .85 .14	.22 .27 .15 .40	.19 .27 .61	.10 .13 .15 .07 .03
1959	.7 1.3 .7 .8 1.3	1.6 1.0 .7	.68 .9 1.5 .7	.9 .7 1.2 1.1	1.5 1.1 .5 .3 .7	.4 .3 .5 .4	1.3 1.4 .9 .6 .4	.6 1.7 .3 .2	.2 .1 1.7 .2	.24 .22 .21 .19 .24	.30 .09 .10 .30	.33 .13 .14 .19 .08
1958	1.2 3.1 2.9 3.4 10.7	3.4 3.7 3.2	2.1 3.0 5.8 1.3	4.1 1.5 3.9 1.2	2.6 14.5 2.10 2.0 2.0	.9 1.4 1.3 2.3	2.4 1.3 2.0 1.2	.9 1.0 .8 1.7 1.4	1.3 1.0 .6 .6	6.0 .49 .898 1.67 .91	.75 .6 .6 1.3	1.2 1.0 2.4 .6
1957	1.7 .51 1.7 1.17	2.6 1.9 1.7 1.20	2.3 1.7 1.3 1.74	2.54 2.2 4.03 2.0	.920 3.2 3.8 1.2 2.0	1.6 4.12 1.5 2.1	3.4 1.7 7.2 3.8	4.3 5.0 5.2 1.5	1.6 2.0 1.4 1.4	.53 1.0 2.30 1.30	1.60 2.80 3.40 1.24 1.10	1.40 2.80 1.70 2.30

WATER SAMPLE RESULTS TAKEN FROM EAST FORK POPLAR CREEK

(Mercury Mg/L)

Up to 1957---Method of Analysis:

Colorimetric

Limit of Error: $\pm 50\%$ at 10 mg/L

YEAR	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1956	.38	<.1	.40	.44	.74	1.03	1.17	1.17	3.6	.5	.94	.74
	.43	.27	.46	.32	.70	1.31	.56	.67	.8	1.3	.74	.87
	.32	.18	.10	.55	.42	.37	.96	1.19	.8	1.1	.71	.71
	.36	.34	.78	.55	.58	.89	1.32	2.31	1.4	.48	.79	1.2
			.55			.45		3.60	3.6		.96	
											.94	
											.78	
											2.0	
											1.5	
1955	.15	.59	1.09	1.48	1.98	1.93	1.06	1.05	1.28	.44	.74	.23
	Avg.	Avg.	Avg.	Avg.	Avg.	Avg.	Avg.	Avg.	1.16	.33	.71	.40
									1.89	.73	.79	.57
									1.07	1.08	.96	1.48
									.84	.84		.63
1954	--	--	--	.28*	.10*	.23*	.23*	.13*	.54*	.25*	.191*	.14*

*Avg. monthly concentration in EPFC at east end of Y-12, expressed in Mg solvent/liter H₂O

During 1955-1963, water samples were obtained by a Tribullar proportional sampler for mercury in Y-12's industrial ditch. Since 1963, all other results were obtained from the effluent of New Hope Pond.

FISH DATA
for
EAST FORK POPLAR CREEK,
BEAR CREEK, POPLAR CREEK,
and
THE CLINCH RIVER

FROM: ORNL Report ORNL/CF-82/257

"Mercury Contamination in East Fork Poplar Creek
and Bear Creek"

BY: W. Van Winkle, et al.

DATE: September 7, 1982

ORNL-DWG 82-13945

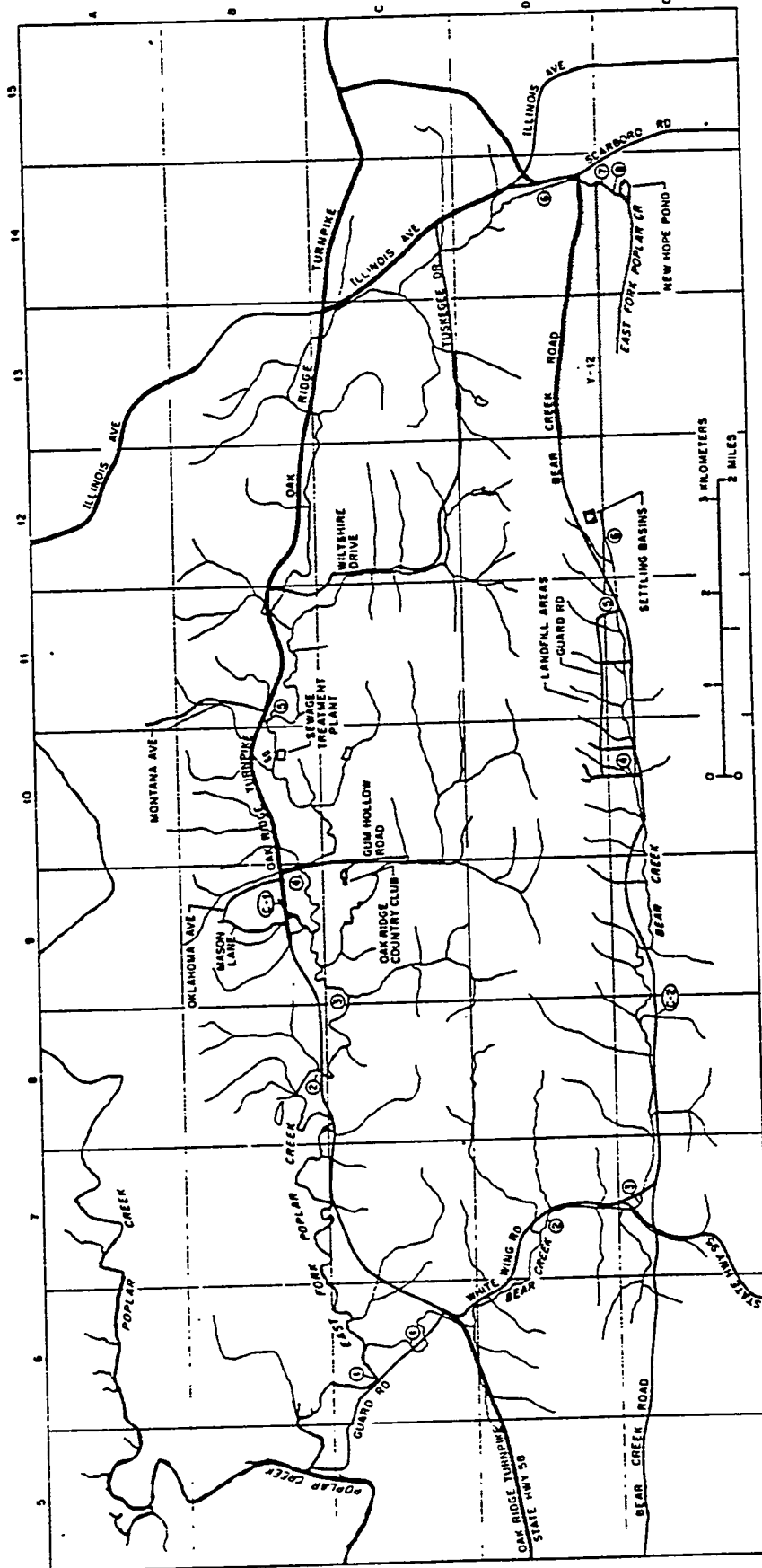


Fig. 1. Location of sampling stations on East Fork Poplar Creek and Bear Creek. Table 1 gives types of samples collected at each station. Sites C-1 and C-2 are control stations for sediment samples.

Table A-1. Total mercury concentration in the axial muscle of fish from East Fork Poplar Creek (EFPC) and Bear Creek (BC). Locations of the sampling stations for each stream are given in Tables 1 and 2

Stream and station number	Species	Sex ^a	Weight (g)	Standard length (mm)	Total Hg concentration ($\mu\text{g Hg/g fresh wt}$)
EFPC-8	Bluegill	I	28.9	121	2.1
		I	34.1	125	1.8
		I	38.3	136	2.0
		F	55.7	146	1.7
		F	62.1	158	3.6
		M	85.3	168	1.8
		M	135.4	179	1.9
EFPC-7	Bluegill	I	19.8	105	0.69
		I	29.1	118	1.7
		I	31.2	120	1.7
		F	33.8	125	1.8
		F	36.3	126	0.66
		F	43.9	133	1.3
		F	63.9	158	1.2
		M	76.4	162	2.7
		M	85.3	159	1.5
		M	121.8	184	2.3
		M	130.1	182	2.3/2.7 ^b
	Green sunfish	M	75.3	149	1.8
EFPC-5	Bluegill	I	8.5	72	1.2
		F	21.5	112	0.84
		I	24.6	112	0.73
		F	39.2	118	1.7
		M	41.7	125	1.4
		F	43.3	127	2.0
		F	61.2	137	1.1
		F	67.2	143	1.3
		F	87.4	152	1.7
		M	91.2	155	1.3/0.97 ^b
		F	114.7	165	2.2
EFPC-1	Bluegill	ND	14.7	91	0.32
		ND	17.0	100	0.56
		ND	21.2	113	0.66
		ND	21.5	97	0.50
		ND	23.4	105	0.46
		ND	25.9	110	0.70
		F	37.5	121	0.45/0.52 ^b
		NO	38.2	123	0.59
		ND	41.5	122	0.60
		ND	46.0	130	0.52
		M	70.7	140	0.72
	Largemouth bass	F	19.0	123	1.3
	White bass	I	24.4	146	0.15
		F	729.7	388	0.38/0.34 ^b
	Rock bass	F	57.6	135	0.63
		M	82.1	154	0.87

Table A-1. (continued)

Stream and station number	Species	Sex ^a	Weight (g)	Standard length (mm)	Total Hg concentration (µg Hg/g fresh wt)
BC-1	Bluegill	M	30.3	121	0.33
		M	31.1	116	0.38
		M	35.7	121	0.51
	Rock bass	ND	29.5	116	0.25
		F	30.7	121	0.25
		F	39.5	125	0.33
		F	39.7	135	0.31
		F	53.5	141	0.27
		M	67.6	157	0.25
		M	80.1	160	0.26
		M	87.0	164	0.27/0.31 ^b
		M	100.5	173	0.29
		F	108.9	180	0.62
		F	118.5	185	0.76/0.86 ^b
		F	180.4	200	1.1/1.2
		M	177.8	205	0.83/0.74 ^b
	Largemouth bass	F	154.2	218	0.62
		F	163.4	224	0.69

^aI = immature, F = female, M = male, ND = not determined.

^bAnalyses of replicate muscle samples.

POPLAR CREEK

FISH SAMPLING DATA

SPECIAL SAMPLING PROGRAM

1982 ONLY

SAMPLING SITES AND METHODS

The three sampling sites are indicated in the attached figure as PC-1, PC-2, and PC-3. These are the same three sampling sites in Poplar Creek used during the ORGDP survey in 1977-1978 (Loar, 1981). The trotlines used to collect catfish at station PC-2 on June 3, 1982, were actually set several 100 meters downstream from the triangle in the attached figure at the bend in the river but upriver from the Blair Road bridge. With the exception of using trotlines on June 3 to increase the sample size of catfish, fish were collected and processed as described in Loar (1981, pp. 32-33).

Loar, J. M. (ed.) 1981. Ecological studies of the biotic communities in the vicinity of the Oak Ridge Gaseous Diffusion Plant. ORNL/TM-6714.

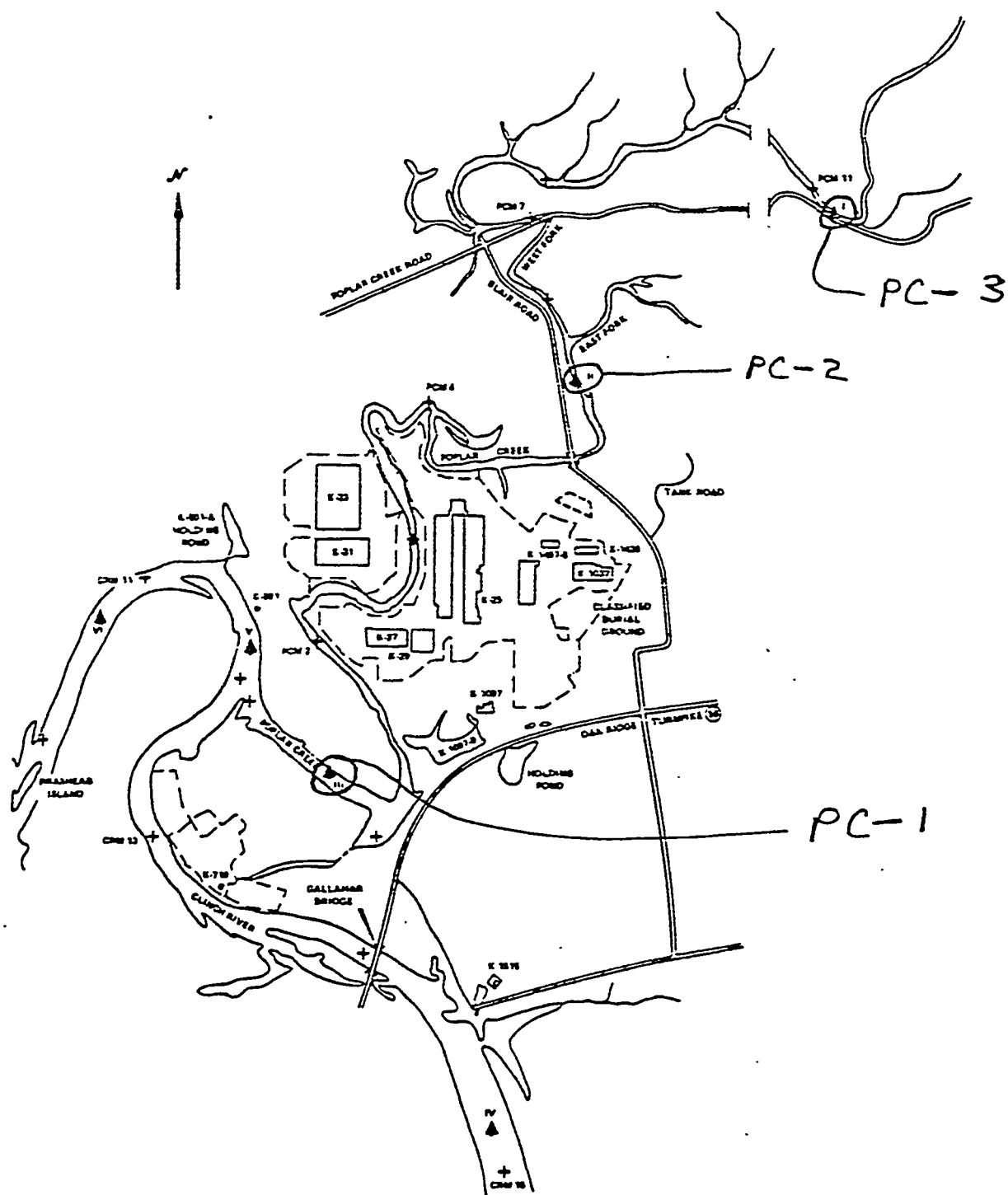


Fig. 1.2-1. Location of the six sites (▲) on Poplar Creek and the Clinch River where biological sampling was conducted during the ORGDP survey, April 1977-September 1978.

FROM: Loar, J. M. (ed.) 1981. Ecological studies of the biotic communities in the vicinity of the Oak Ridge Gaseous Diffusion Plant. ORNL/TM-6714.

Table 1. Results from Fish Analysis Program

Location (Poplar Creek)	Sample Code	Species	Length (cm)	Weight (gram)	Sex	PCBs as 1260 µg/g Fish	Uranium µg/g Fish	CH ₃ Hg ⁺ as Hg µg/g Fish
PC-1	1	Yellow Bass	16.8	54.5	F	0.1	0.007	0.25
"	2	" "	17.6	65.5	F	<0.1	0.007	0.20
"	3	" "	17.5	63.1	M	0.2	<0.003	0.18
"	4	" "	17.7	65.4	F	<0.1	<0.003	0.09
"	5	" "	16.5	58.6	M	0.1	0.004	0.18
"	6	" "	17.1	62.4	M	0.2	0.010	0.11
"	7	" "	14.0	32.8	M	<0.1	0.012	0.10
"	8	" "	14.1	32.8	F	<0.1	0.011	0.08
"	9	" "	13.0	28.4	M	0.1	0.010	0.06
"	10	" "	13.5	28.5	M	<0.1	0.018	0.09
"	11	Drum	22.6	132.7	M	<0.1	0.007	0.08
"	12	"	16.0	38.7	M	<0.1	0.015	0.07
"	13	Bluegill	15.7	84.7	F	<0.1	0.009	0.07
"	14	"	13.7	54.3	M	<0.1	0.007	0.15
"	15	"	14.7	72.7	M	<0.1	0.007	0.23
"	16	"	12.2	36.0	M	<0.1	0.004	0.32
"	17	"	11.3	31.6	F	<0.1	0.009	0.24
"	18	Striped Bass	14.1	23.0	?	0.2	0.008	0.08
"	19	" "	24.0	153.9	M	<0.1	<0.003	<0.05
"	20	White Bass	29.3	315.4	M	<0.1	0.004	<0.05
"	21	Hybrid	38.7	817.1	M	<0.1	0.005	0.28
"	22	Spotted Bass	13.7	35.7	F	<0.1	<0.003	0.11
"	23	Channel Catfish	51.6	1255.6	?	0.4	<0.003	1.34
PC-2	24	Crappie	17.7	50.3	?	0.4	0.009	0.48
"	25	"	20.0	70.2	M	0.3	0.005	0.55
"	26	"	21.8	98.1	M	0.1	<0.003	0.39
"	27	"	21.6	93.8	F	0.1	<0.003	0.46
"	28	"	20.3	85.9	F	0.2	0.004	0.31
"	29	"	20.3	84.3	F	0.2	<0.003	0.34
"	30	"	22.3	108.2	F	0.4	0.004	0.46
"	31	"	19.5	66.1	F	0.2	0.005	0.35
"	32	"	20.5	81.1	F	0.2	0.006	0.40
"	33	"	34.2	546.6	F	0.2	<0.003	0.63
"	34	Yellow Bass	17.2	56.6	F	0.1	0.010	0.52
"	35	" "	18.9	65.9	F	0.2	0.007	0.42
"	36	" "	16.1	46.1	M	0.3	0.013	0.50
"	37	" "	14.6	33.7	F	0.1	0.019	0.09
"	38	" "	16.0	59.9	F	0.1	0.011	0.35
"	39	" "	14.5	31.8	M	0.3	0.013	0.12
"	40	" "	13.4	25.2	M	0.2	0.017	0.07
"	41	" "	13.7	27.3	M	<0.1	0.009	0.14
"	42	" "	11.8	17.9	M	<0.1	0.012	0.43

Table 1. Results from Fish Analysis Program (continued)

Location (Poplar Creek)	Sample Code	Species	Length (cm)	Weight (gram)	Sex	PCBs as 1260 µg/g Fish	Uranium µg/g Fish	CH ₃ Hg ⁺ as Hg µg/g Fish
PC-2	43	Drum	24.5	165.8	F	<0.1	0.007	0.52
"	44	Sm. Mouth Bass	14.5	29.0	M	<0.1	0.007	0.58
"	45	Lg. Mouth Bass	13.5	25.0	M	<0.1	0.006	0.64
"	46	" " "	22.9	145.8	F	<0.1	<0.003	1.03
"	47	Bluegill	15.4	58.9	M	<0.1	<0.003	0.69
"	48	"	15.6	81.9	F	<0.1	0.004	0.40
"	49	"	14.6	48.9	F	<0.1	0.017	0.50
"	50	"	13.6	39.9	F	<0.1	0.004	0.40
"	51	"	13.1	45.0	M	<0.1	0.006	0.36
"	52	"	12.1	37.8	F	<0.1	<0.003	0.44
"	53	"	12.1	36.8	M	<0.1	0.009	0.42
"	54	"	10.6	19.4	M	<0.1	<0.003	0.45
"	55	"	10.3	18.7	M	0.1	0.009	0.39
"	56	"	9.3	13.2	M	<0.1	INS	0.33
"	91	Blue Catfish	39.6	492.0	F	<0.1	0.008	0.06
"	92	" "	35.4	341.0	M	<0.1	0.009	0.07
"	93	Channel Catfish	44.1	887.0	F	0.5	0.007	1.07
"	94	" "	55.2	225.5	F	0.7	0.004	0.29
"	95	" "	56.1	1750.0	M	0.5	0.005	0.40
"	96	" "	52.7	1539.0	M	0.3	0.008	0.70
PC-3	57	Crappie	21.7	110.5	F	<0.1	<0.003	0.11
"	58	"	23.0	123.1	F	0.2	<0.003	0.48
"	59	"	22.4	104.1	M	<0.1	<0.003	0.17
"	60	"	24.0	138.3	F	<0.1	<0.003	0.37
"	61	"	21.1	93.1	M	<0.1	0.005	0.15
"	62	"	21.8	105.8	M	<0.1	<0.003	0.42
"	63	"	21.6	91.3	M	<0.1	<0.003	0.23
"	64	Bluegill	19.4	158.4	M	<0.1	0.004	0.35
"	65	"	18.5	135.5	M	<0.1	<0.003	0.47
"	66	"	16.7	106.6	M	<0.1	0.004	0.30
"	67	"	18.9	142.3	M	<0.1	0.004	0.52
"	68	"	17.7	110.3	F	<0.1	0.001	0.78
"	69	"	15.8	74.7	F	<0.1	0.004	0.40
"	70	"	14.0	60.5	M	<0.1	0.004	0.28
"	71	"	13.9	54.8	F	<0.1	0.005	0.24
"	72	"	12.2	31.2	F	<0.1	0.015	0.38
"	73	"	11.7	27.8	F	<0.1	0.006	0.21
"	74	Drum	26.2	163.9	M	0.1	<0.003	0.15
"	75	"	21.9	108.6	M	<0.1	<0.003	0.08
"	76	"	20.3	74.2	M	<0.1	0.004	0.30
"	77	Lg. Mouth Bass	25.1	204.8	M	<0.1	0.003	0.43
"	78	" " "	19.0	76.4	M	<0.1	<0.003	0.59
"	79	" " "	14.9	33.2	M	1.0	0.006	0.38

Table 1. Results from Fish Analysis Program (continued)

Location (Poplar Creek)	Sample Code	Species	Length (cm)	Weight (gram)	Sex	PCBs as 1260 µg/g Fish	Uranium µg/g Fish	CH ₃ Hg ⁺ as Hg µg/g Fish
PC-3	80	Sauger	37.5	371.1	M	<0.1	0.003	0.26
"	81	"	44.6	734.6	M	0.2	0.004	0.44
"	82	"	46.9	951.6	F	0.1	0.003	0.70
"	83	"	39.1	484.0	M	0.2	0.025	0.63
"	84	"	38.3	524.1	M	0.2	0.009	0.24
"	85	Blue Catfish	52.7	1313.1	M	0.5	0.007	0.18
"	86	Channel Catfish	31.5	238.2	M	0.1	0.005	0.12
"	87	"	35.0	352.2	M	0.4	0.013	0.11
"	88	Yellow Catfish	34.8	300.5	M	0.3	0.005	0.06
"	89	"	47.5	1083.0	M	0.4	0.011	0.15
"	90	"	37.5	435.2	M	<0.1	0.005	0.11

INS = Insufficient sample

Table 2. Comparison of Reference Values and ORGDP Values for PCBs in Fish Concentrate No. 1A

U.S. EPA Reference Value µg/g		ORGDP value µg/g
PCB 1260	0.92 ± 0.36	1.4 ± 0.3*
PCB 1254	3.12 ± 1.32	
PCB 1242	1.12 ± 0.83	

* Average of 12 determinations

A At 95% confidence limit

REFERENCES

1. Environmental and Effluent Analysis Control Manual, Union Carbide Corporation, Nuclear Division.
2. ASTM, Part 31, Methods for Water, D3534-76-T, 1978.
3. Fed. Regis., 44, 38330 (June 29, 1979).
4. Anal. Chem., 1981, 53, 2305.
5. Environmental Research 1971, 4, 1-69
6. Chemical Fallout; M. W. Miller, G. G. Berg, Eds., Charles C. Thomas, Springfield, IL, 1969, p. 75.

FROM: UCC-ND Report Y/UB-18

"Environmental Monitoring Report - United States
Department of Energy - Oak Ridge Facilities -
Calendar Year 1982"

BY: Union Carbide Corporation - Nuclear Division

DATE OF ISSUE: May 1, 1983

Table 28
MERCURY CONTENT IN CLINCH RIVER FISH
1982

LOCATION	Species ^a	CONCENTRATION ng/g - Wet Weight	% A.L. ^b	PPM [*]
CRM 5.0	Bass	120	12	.12
	Blue Gill	170	17	.17
7 miles below Poplar Creek	Carp	280	28	.28
	Shad	30	3	.03
	Crappie	59	6	.06
CRM 10.0	Bass	200	20	.20
	Blue Gill	150	15	.15
2 miles below Poplar Creek	Carp	210	21	.21
	Shad	29	3	.03
	Crappie	99	10	.10
CRM 12.0	Bass	220	22	.22
	Blue Gill	560	56	.56
Poplar Creek	Carp	530	53	.53
	Shad	190	19	.19
	Crappie	180	18	.18
CRM 20.8 ^c	Bass	99	10	.10
	Blue Gill	160	16	.16
White Oak Creek	Carp	240	24	.24
	Shad	19	2	.02
	Crappie ^d	43	4	.04
CRM 25.0	Bass	13	1	.01
	Blue Gill	34	3	.03
2 miles above Melton Hill Dam	Carp	97	10	.10
	Shad	7	1	.01

^aComposite of ten fish in each species.

^bPercent of proposed FDA mercury in fish action level of 1000 ng/g.

^cAverage of quarterly samples.

^dAverage of three quarterly samples. Crappie were not collected in the second quarter.

*Parts per Million - added for clarification - 7/1/83

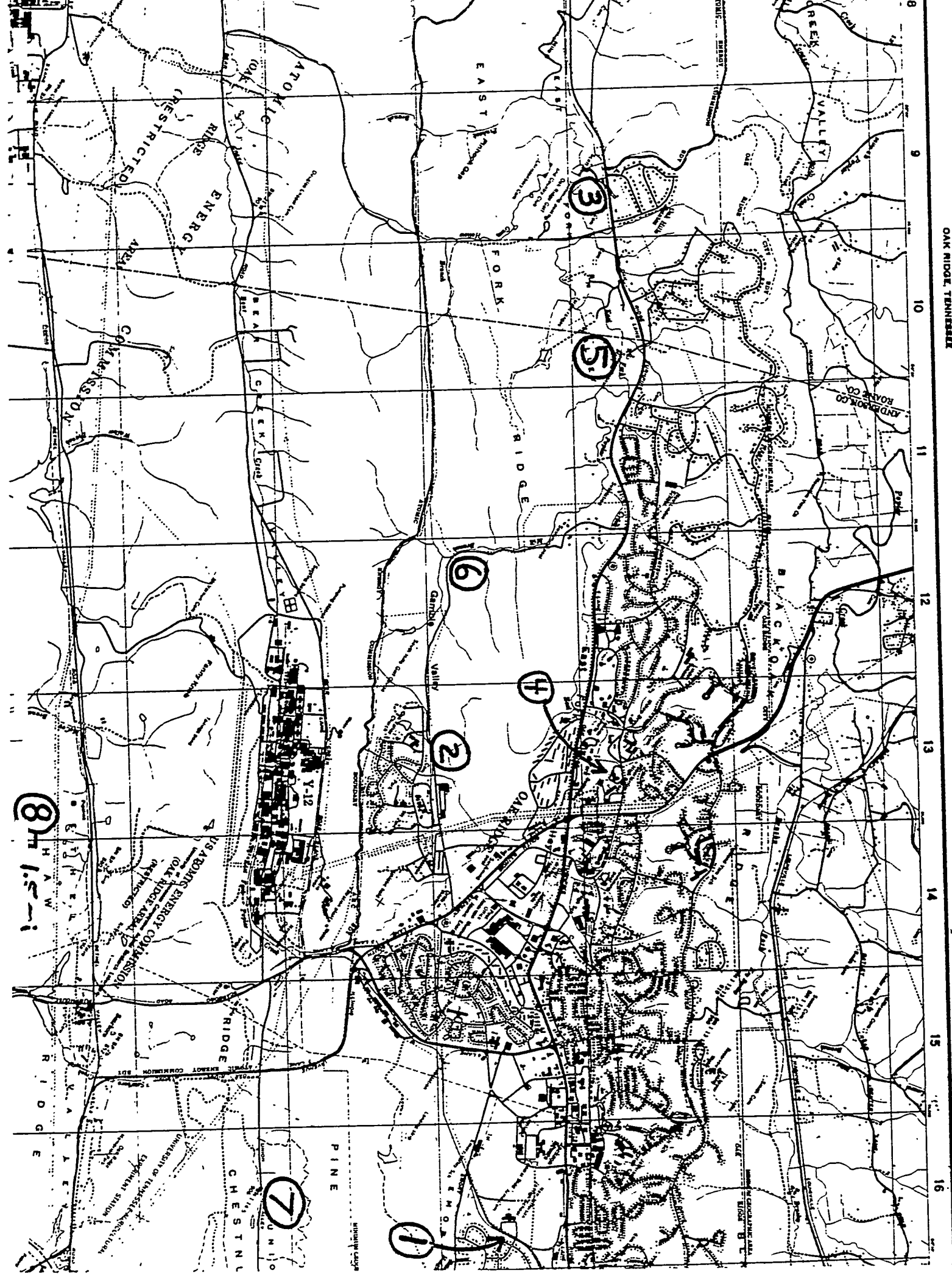
SEDIMENT, WATER, AIR & SOIL DATA

MERCURY SAMPLING AND DATA

The sampling locations listed below are identified on the attached map.

1. Fairbanks Road
2. Scarboro Community
3. Greenvview Estates
4. Robertsville Junior High School
5. East Fork Poplar Creek
6. West Tuskegee Drive
7. Background, Union Road
8. Background, Freels Bend

OAK RIDGE, TENNESSEE



1. FAIRBANKS ROAD

* SOIL (parts per million)

Jefferson Junior High School Area and Fairbanks Road

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
3 Meters from Entrance	5/25/83	83-0001	2.4 ppm
30 Meters from Entrance	5/25/83	83-0002	5.0
60 Meters from Entrance	5/25/83	83-0003	0.05
90 Meters from Entrance	5/25/83	83-0004	2.4
120 Meters from Entrance	5/25/83	83-0005	18
170 Meters from Entrance	5/25/83	83-0006	40
50' North of JJHS Exit on Sewer Line Belt	6/13/83	83-0050	250
40' North of Exit	6/13/83	83-0051	155
30' North of Exit	6/13/83	83-0052	75.0
20' North of Exit	6/13/83	83-0053	250
10' North of Exit	6/13/83	83-0054	230
10' South of Exit	6/13/83	83-0055	120
20' South of Exit	6/13/83	83-0056	155
30' South of Exit	6/13/83	83-0057	140
40' South of Exit	6/13/83	83-0058	150
50' South of Exit	6/13/83	83-0059	200
50' SW of Telephone Pole (Control)	6/13/83	83-0060	4.1
.3 mile from Exit Toward Nautilus Club	6/13/83	83-0061	155

2. SCARBORO COMMUNITY

* WATER (parts per billion)

Scarboro Community

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
250' Upstream Spellman Avenue	6/14/83	83-0067	<0.05 ppb
200' West of Dillard Avenue	6/14/83	83-0071	<0.05
300' West of Tuskegee Drive	6/14/83	83-0075	0.05
30' North of Tusculum Drive	6/14/83	83-0079	<0.05

* SOIL (parts per million)

Scarboro Community

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
6' from Creek (83-0067)	6/14/83	83-0069	0.40 ppm
20' from Creek (83-0067)	6/14/83	83-0070	0.10
6' from Creek (83-0071)	6/14/83	83-0073	0.15
30' from Creek (83-0071)	6/14/83	83-0074	0.80
10' from Creek (83-0075)	6/14/83	83-0077	<0.05
100' from Creek (83-0075)	6/14/83	83-0078	<0.05
10' from Creek (83-0079)	6/14/83	83-0081	0.05
Floodplain 30' North of Tusculum Drive & 150' West of Creek	6/14/83	83-0082	0.85

* SEDIMENT (parts per million)

Scarboro Community

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
250' Upstream Spellman Avenue	6/14/83	83-0068	<0.05 ppm
200' West of Dillard Road	6/14/83	83-0072	<0.05
300' West of Tuskegee Road	6/14/83	83-0076	<0.05
30' North of Tusculum Drive	6/14/83	83-0080	0.05

2. SCARBORO COMMUNITY

PAGE 2

* TURTLES

Scarboro Community

LOCATION	RESULTS [$\mu\text{gHg/g(Avg)}$]
Tuskegee Creek	0.12
Tuskegee Creek	0.058
South Hills Pond	0.056
East Fork Poplar Creek (Winn-Dixie)	0.46

3. GREENVIEW ESTATES

* WATER (parts per billion)

Greenview Estates - East Fork Poplar Creek

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
#8 on Map	6/8/83	83-0034	0.25 ppb
#14	6/8/83	83-0040	0.25

* SOIL (parts per million)

Greenview Estates - Small Garden

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
South Edge of House	6/8/83	83-0031	8.0 ppm

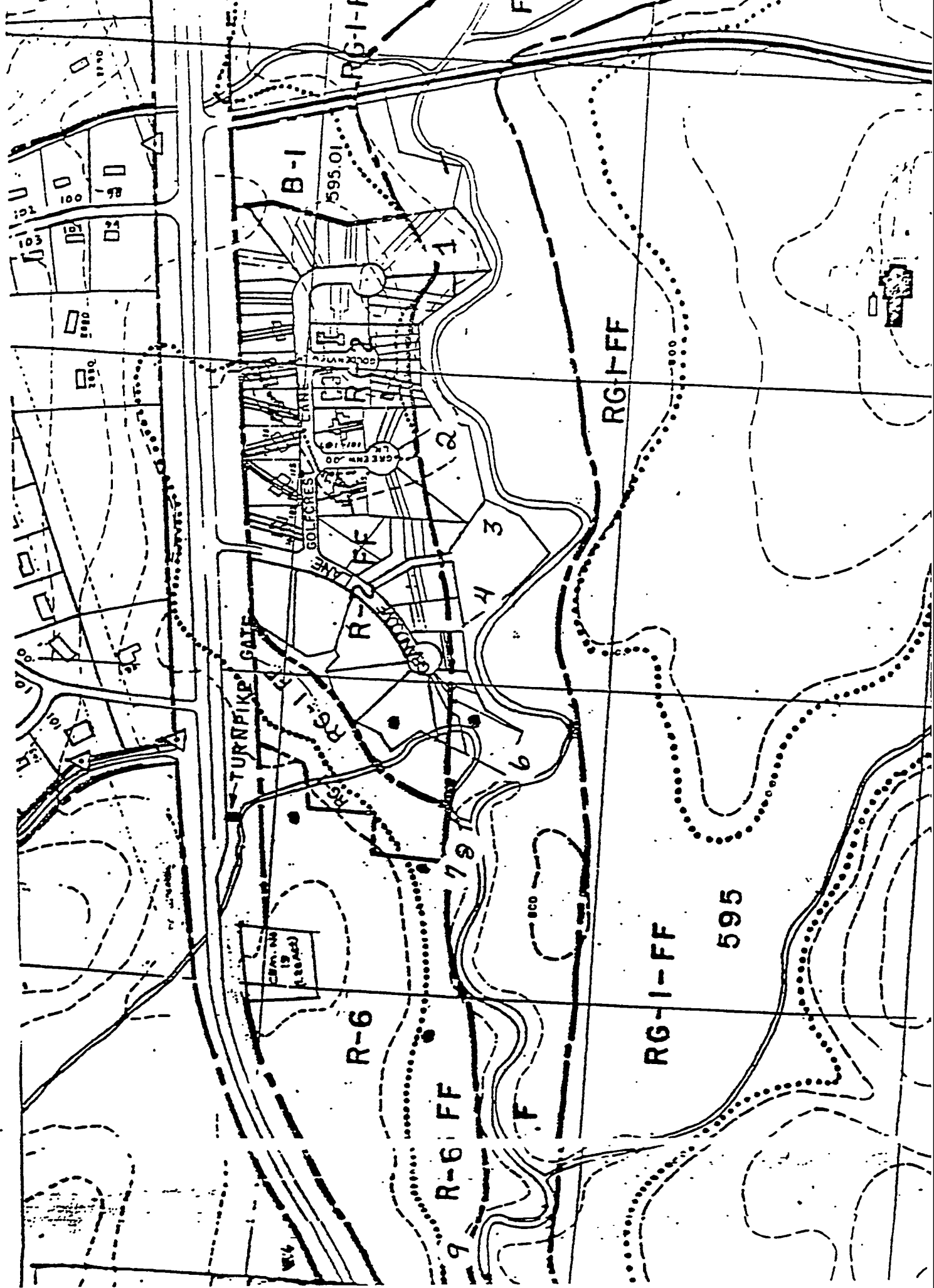
Greenview Estates - Along Creek (See Map) (Undisturbed Soil)

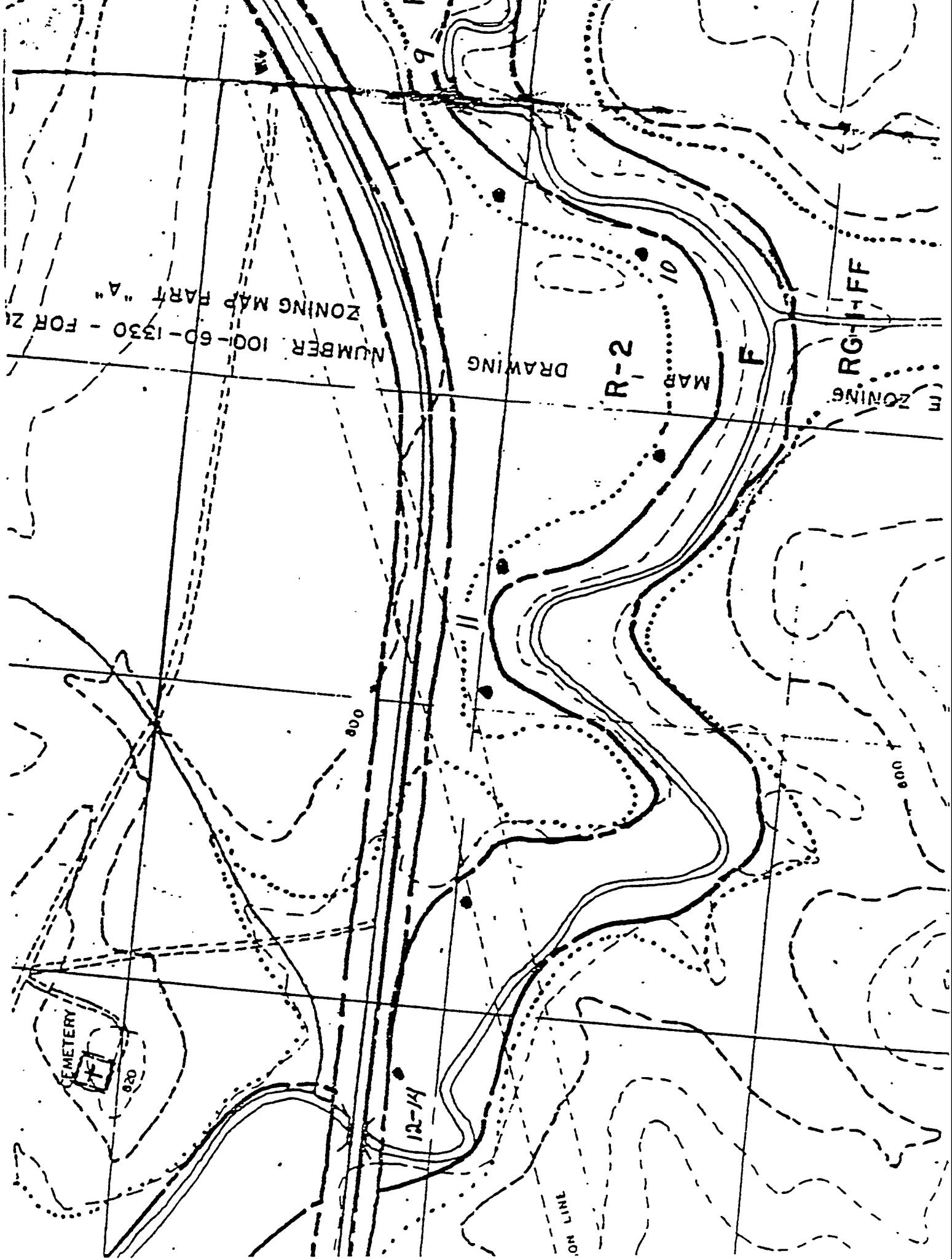
LOCATION	DATE COLLECTED	SAMPLE	RESULTS
#1 on Map	6/8/83	83-0027	1.5 ppm
#2	6/8/83	83-0028	5.2
#3	6/8/83	83-0029	1.1
#4	6/8/83	83-0030	25
#6	6/8/83	83-0032	14
#7	6/8/83	83-0033	13
#9	6/8/83	83-0035	18
#10	6/8/83	83-0036	9.0
#11	6/8/83	83-0037	1.8
#12	6/8/83	83-0038	35

* SEDIMENT (parts per million)

Greenview Estates - East Fork Poplar Creek

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
100' Upstream of Turnpike Bridge	6/8/83	83-0039	39 ppm





4. ROBERTSVILLE JUNIOR HIGH SCHOOL

* WATER (parts per billion)

Robertsville Junior High School including Tennis Courts and Robertsville Area

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
Creek behind Robertsville Jr. High	5/25/83	83-0008	0.75 ppb
Creek behind Green's Honda	5/27/83	83-0017	0.40
Creek at Robertsville Jr. High	5/27/83	83-0013	0.35
Creek at Robertsville Jr. High	5/27/83	83-0011	0.20
Creek at Robertsville	5/27/83	83-0015	0.35

Oak Ridge City - Outside Swimming Pool

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
Spring House	6/3/83	83-0024	<0.1 ppb
North Side Pool	6/3/83	83-0023	<0.1
South Side Pool	6/3/83	83-0022	<0.1

* SOIL (parts per million)

Robertsville Junior High School Area

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
Edge of Creek	5/25/83	83-0010	10 ppm
5 yards from Creek-Near West Ballfield	5/27/83	83-0012	9.0
5 yards from Creek-Between West & East Ballfields	5/27/83	83-0014	15
5 yards from Creek-Centerfield East	5/27/83	83-0016	13
Baseball Diamond - Home Plate	6/20/83	83-0094	0.05
Pitcher's Mound	6/20/83	83-0095	0.1
Edge of Infield Behind Second Plate	6/20/83	83-0096	0.3

4. ROBERTSVILLE JUNIOR HIGH SCHOOL

PAGE 2

Jefferson Avenue (50' Upstream from SW Corner of Bridge)

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
30' West, Approximately 6' Upstream Bank	6/13/83	83-0063	37 ppm
30' West of 83-0063	6/13/83	83-0064	35
85' 180° from SW Corner of Bridge	6/13/83	83-0065	18
200' 107° from SW Corner of Bridge	6/13/83	83-0066	16.5

Jefferson Avenue Behind Green's Honda

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
5 yards from Creek	5/27/83	83-0018	15 ppm

Garden Area Behind YWCA

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
Soil on Asphalt Pad	6/8/83	83-0026	0.30 ppm
Southeast Corner	6/9/83	83-0041	0.25
20' from East Edge of Garden	6/9/83	83-0042	0.30
20' from East Edge of Garden	6/9/83	83-0043	0.20
Center of Garden	6/9/83	83-0044	0.20
Southwest Corner of Garden	6/9/83	83-0045	0.20
Northwest Corner of Garden	6/9/83	83-0046	0.17

* SEDIMENT (parts per million)

Bank Samples

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
3' from Creek, Near NE Corner	6/9/83	83-0048	42 ppm
3' from Creek, 30' Upstream	6/9/83	83-0049	52
50' Upstream from SW Corner of Bridge	6/13/83	83-0062	27

5. EAST FORK POPLAR CREEK

* WATER (parts per billion)

East Fork Poplar Creek

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
Creek at Gum Hollow Road	5/25/83	83-0009	1.4 ppb
Creek at Big Turtle Park	5/25/83	83-0019	0.45

* SOIL (parts per million)

Big Turtle Ballfield Area

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
5 yards from Creek	5/27/83	83-0020A	0.06 ppm
Home Plate	6/20/83	83-0091	0.05
Pitcher's Mound	6/20/83	83-0092	0.10
Edge of Infield Behind Second Plate	6/20/83	83-0093	0.05

* SEDIMENT (parts per million)

Gum Hollow Road

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
Creek Sediment	5/25/83	83-0007	6.3 ppm

6. WEST TUSKEEGEE DRIVE

* WELL WATER (parts per billion)

Water from Two Wells

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
1001 Tuskegee Drive	5/27/83	83-0020	<0.1 ppb
1101 Tuskegee Drive	5/27/83	83-0021	<0.1

7. BACKGROUND, UNION ROAD

* SOIL (parts per million)

Union Road

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
.1 mile on Union East of Illinois	6/14/83	83-0083	.05 ppm
Same as 83-0083 - 300' South of Road	6/14/83	83-0084	.10
Same as 83-0083 - 600' South of Road	6/14/83	83-0085	.10
.3 miles East of Hwy 62 North of Union Road	6/15/83	83-0089	<.05
Same as 83-0089 - Further Off Road	6/15/83	83-0090	.10

8. BACKGROUND, FREELS BEND

* SOIL (parts per million)

Freels Bend

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
Opposite Side of Cabin at Inlet 80' South of Telephone Pole	6/15/83	83-0086	0.2 ppm
50' South of Pole	6/15/83	83-0087	0.1
100' South of Pole	6/15/83	83-0088	0.05

VEGETABLE DATA

MERCURY IN VEGETABLES

<u>Vegetable</u>	<u>Mercury Content (PPM)</u>	<u>Soil Analysis (PPM)</u>
Tomato (1 sample)*	<0.002	0.90*
Carrot (from California)**	0.004	

*From garden on Gum Hollow Road.

**Control Sample from Local Supermarket

COPY

MEMORANDUM OF UNDERSTANDING
BETWEEN THE
U.S. DEPARTMENT OF ENERGY
AND THE
U.S. ENVIRONMENTAL PROTECTION AGENCY AND
STATE OF TENNESSEE DEPARTMENT OF HEALTH AND ENVIRONMENT
CONCERNING COMPLIANCE WITH POLLUTION CONTROL
STANDARDS AT THE DEPARTMENT OF ENERGY Y-12
PLANT, ANDERSON AND ROANE COUNTIES, TENNESSEE

This Memorandum of Understanding (MOU) is intended to clarify the compliance objectives agreed upon by the parties during a meeting held in Atlanta on April 8, 1983. Analysis of information received from the Department of Energy (DOE) along with information gathered as a result of a February 23, 1983, Compliance Evaluation Inspection by the Tennessee Department of Health and Environment (TDHE) revealing serious environmental problems associated with past and present waste disposal practices at the Department of Energy (DOE) Y-12 facility, necessitate that expeditious and thorough investigative and remedial measures be taken. To this end, this MOU provides the actions agreed upon by the parties as constituting preliminary measures toward DOE achieving full compliance with all federal and state pollution control laws at its Y-12 facility. It is understood and agreed to by the parties that this MOU serves as a work plan for obtaining information, from which it is anticipated, further plans, actions and remedial programs will be developed. The plans, actions and remedial programs encompassed by this MOU shall be implemented in accordance with applicable regulatory requirements.

It is further understood and agreed that the compliance measures to be taken at Y-12 include but are in no way limited to those outlined herein. Furthermore, no party to this MOU in any way waives its rights to any other action or remedy available to it by law, nor is precluded from taking or requiring additional action with respect to environmental problems presently known to exist, or which may later be found to exist at this facility, nor shall the MOU constitute an admission of liability or a waiver of any defense.

Exhibit 7

COPY

To carry out the intent of this MOU the parties agree to take action with respect to each of the areas of the Y-12 facility, as those areas are further described in the March 8, 1983, TDHE Notice of Noncompliance with which all parties hereto are familiar.

I. Upper East Fork of Poplar Creek (EFPC) - also known as the "industrial ditch"

- I. DOE agrees to submit to TDHE and to the Environmental Protection Agency (EPA), on or before May 31, 1983, a preliminary report containing the following information:
 - a. A map showing all Y-12 discharges to upper EFPC;
 - b. The effluent description of all Y-12 discharges to upper EFPC, including process description and flow quantification (process and cooling water); and
 - c. Interim treatment/control measures - including treatment and/or elimination (provide plans and specifications as necessary as well as schedule for same).
2. DOE agrees to submit to EPA and TDHE an assessment of coal storage and steam plant management plans to include water quality impacts on or by July 29, 1983.
3. TDHE and EPA agree to review the preliminary report and meet on site to determine further needs and to submit comments to DOE on/or before July 1, 1983.

4. DOE agrees to submit a final report on/or before September 15, 1983, verifying the information described in 1.a. and b. above and designating the discharge points to be eliminated. A progress meeting will be held on or before September 15, 1983, to discuss waste water characterizations.
5. DOE agrees to provide to EPA and TDHE a final detailed waste water characterization by November 15, 1983.
6. DOE agrees to submit plans and specifications for all proposed interim treatment or control measures on or before December 15, 1983.
7. DOE agrees to submit all permit applications for the remaining discharges to EFPC on/or before December 15, 1983.

II. Pollutants Discharged from New Hope Pond (NHP)

1. DOE agrees to immediately take steps as outlined below to eliminate NHP as an NPDES discharge point.
2. DOE agrees to submit a report to EPA and TDHE on/or before July 1, 1983, containing:
 - a. characterization of sediments in NHP;
 - b. assessment of active sources of mercury contamination;
 - c. plans and specifications for the NHP by-pass and its use for spill prevention and control; and

- d. plans and specifications for cleaning out NHP.

III. New Hope Sludge Disposal Area

1. DOE agrees to submit to EPA and TDHE on/or before July 29, 1983, results of leachability tests.
2. DOE agrees to submit a report, on/or before August 31, 1983, evaluating site suitability and management practices.

IV. S-3 Ponds

The defined objective of the MOU is to cease all waste contributions to the S-3 ponds, and to eliminate the S-3 ponds as sources of contamination to surface and groundwater.

1. Elimination of waste contributions to S-3 ponds

On or before July 1, 1983, DOE agrees to submit to EPA and TDHE a proposal to cease all discharge of waste to the S-3 ponds. The proposal will include source description, waste stream characterization including chemical and radiological parameters, and volume/frequency of discharge. This proposal will include a management strategy for treatment elimination and/or containment of all waste currently entering the S-3 ponds with an implementation schedule for each descriptive category. Where appropriate, waste contribution elimination proposals will be implemented in an expedient manner.

2. Close out of S-3 ponds.

- a. DOE agrees to perform a definitive characterization of the S-3 ponds to be completed on or before July 15, 1983.
 - b. On or before September 1, 1983, DOE agrees to submit a closeout proposal to include plans and specifications and implementation schedule.
3. Upon elimination of the S-3 ponds as a source of contamination to surface waters, DOE agrees to submit a plan and schedule for rehabilitation of Upper Bear Creek.
4. DOE shall establish on/or before July 1, 1983, a monitoring point at the discharge from the S-3 Ponds and establish the parameters to be monitored.

V. Burial Ground Oil Pond

1. DOE agrees to submit to EPA and TDHE on/or before November 1, 1983, a report to characterize wastewaters discharged from the pond and submission of NPDES application for the discharge.
2. DOE agrees to submit to EPA and TDHE on/or before January 31, 1984, a report to include:
 - a. An inventory of waste deposited in the pond watershed;

- b. A sediment assessment and inventory of existing contamination together with biological information regarding this area.
3. Based on parties' review and discussion of the report described in subparagraph 2, above, DOE agrees to take further appropriate action, which may include a plan for elimination of the sources of pollution to the pond and ultimate cleanup and closure of the pond.

VI. Isolation Area

DOE agrees to submit to EPA and TDHE on/or before January 31, 1984, an inventory of waste deposited in this area.

VII. Disposal Pits

1. DOE agrees to submit to EPA and TDHE a schedule for closure (including plans for alternate disposal) on/or before November 1, 1983.

VIII. Oil Land Farm

1. DOE agrees that, on or before November 1, 1983, it will:
 - a. Implement a plan for preventing material from reaching waters of the State and United States, including interim erosion control measures by July 15, 1983; and
 - b. Submit a description of runoff from this site; and

- c. Submit an evaluation of alternative actions at this site, including establishment of an NPDES discharge point or ultimate cleanup and closure.
2. DOE agrees that, in the event it selects the alternative of establishing an NPDES discharge point under 1.c., above, it will submit, on or before December 31, 1983, an NPDES permit application for this site.
3. DOE agrees to submit to EPA and TDHE, on or before January 31, 1984, a report that will include an inventory of material deposited in this area and an inventory of existing contamination.

IX. Contamination of East Fork Poplar Creek and Bear Creek

1. EPA, DOE and TDHE agree to establish and organize a Task Force to include representatives of TDHE, (with the Division of Water Management, TDHE, as lead), TVA, EPA, and DOE for the purpose of studying contamination and formulating a remedial plan if it is determined by EPA, DOE and TDHE that one is necessary. The roles and responsibilities of the task force members will be determined and agreed upon by the parties on/or before July 1, 1983.
2. The contamination study will include but not be limited to the following items:
 - a. Definitive sediment and fishery study for Bear Creek and EFPC;
 - b. Assessment and inventory of flood plain contamination;
 - c. Multiparameter Pu, Hg, Pb, U, Th, Be, PCB Sediment Transport Study;

- d. Ambient air sampling for Hg;
- e. Assessment and management plan regarding urban development disturbance areas adjacent to EFPC and Bear Creek including:
 - i. Distribution of dredge material for home landscaping, fill material and gardening.
 - ii. List of commercial developers, including Corps §404 permittees; and
- f. Public notification.

X. Groundwater Study for Y-12 Facility

- I. On or before May 31, 1983, DOE, through its operating contractor, will award a contract to investigate the hydrologic characteristics of the Bear Creek Valley disposal areas (isolation area, disposal pits, oil pond and trenches and oil landfarm), the S-3 Ponds and the New Hope Pond sludge disposal basin. The purpose of the study is to evaluate the groundwater flow, monitoring data and the adequacy of the existing Y-12 groundwater monitoring program. It is expected that the results of this investigation will provide information to assess site conditions, determine if significant contamination to the groundwater has resulted from operations and assess the need and feasibility of corrective measures. If the contractor evaluates DOE's monitoring well network as being inadequate to fulfill the requirements of 40 CFR 264, 265 and 122.25, the contractor will recommend locations for additional wells and provide sketches and criteria for installation of the wells.

2. On or before June 30, 1983, DOE will submit to TDHE and EPA the contractor's plan of study.
3. EPA and TDHE will submit comments on the plan of study by July 15, 1983.
4. On or before December 31, 1983, DOE shall submit to TDHE and EPA the final groundwater study report.

XI. Master Monitoring Plan for Y-12

DOE agrees that, on or before July 31, 1983, it will submit to TDHE and EPA a master monitoring plan for groundwaters and surface waters of the entire Y-12 facility, indicating all present sampling locations and all parameters analyzed.

In the process of characterizing existing wastewaters, wastewater discharges, sediment and sludges of the areas mentioned, DOE will include sufficient analyses to determine whether or not such wastewaters discharged to, or sludges and wastewaters contained in, the areas are hazardous wastes as defined in EPA regulations at 40 C.F.R. Part 261. For those areas which are determined to contain hazardous wastes and which are to be closed, the plan for closure will incorporate the technical requirements for closure contained in Subparts G, K, L, M and N of 40 C.F.R. 264 and 40 C.F.R. 265, as appropriate.

The parties agree that all information required to be submitted by this MOU, and any other correspondence with respect to this MOU, is required to be given in writing, and mailed to each party as follows:


Mr. Howard D. Zeller
Assistant Regional Administrator
for Policy and Management
U.S. Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Dr. Michael T. Bruner
Assistant Commissioner
Tennessee Department of Health and Environment
T.E.R.R.A. Building
2nd Floor
150 Ninth Avenue, North
Nashville, Tennessee 37203

Mr. Joe La Grone
Manager, Oak Ridge Operations
U.S. Department of Energy
P.O. Box E
Oak Ridge, Tennessee 37830


U.S. Environmental Protection Agency

May 26, 1983
Date


U.S. Department of Energy

May 26, 1983
Date


Tennessee Department of Health and Environment

May 26, 1983
Date

ADM/kav D/3

DOE NEWS:

JOE LA GRONE
Manager, Oak Ridge Operations
Department of Energy
Oak Ridge, Tennessee

Joe La Grone is the Manager of the Department of Energy's Oak Ridge Operations, a major field office of the Department.

La Grone was named Manager of Oak Ridge Operations on April 5, 1983 after serving as Manager of San Francisco Operations since August, 1978.

As Manager of Oak Ridge Operations, La Grone is responsible for programs and projects involving the production of special nuclear materials, including the enrichment of uranium and other related activities, and the administration of a broad range of production and research and development programs related to nuclear, fossil, and other energy initiatives. Oak Ridge Operations also was assigned overall responsibility for management of the Strategic Petroleum Reserve Project Office in June, 1983.

The combined activities of Oak Ridge Operations have an annual operating budget of \$2.2 billion in Fiscal Year 1983 and are accompanied by a facility design and construction program of over \$900 million for the same period. Revenues from these operations, primarily from uranium enrichment, will be \$1.9 billion for the fiscal year.

From February 10, 1981 to October 5, 1981 he served in dual capacity as Acting Deputy Under Secretary and later as Acting Under Secretary. In September 1980 La Grone received a Distinguished Executive Service Award from the President. In 1981 he was recipient of the Department's Exceptional Service Award and was also presented an award for Special Act of Service by Secretary James B. Edwards.

La Grone is a 1959 graduate of Panola Junior College and was a 1961 honor graduate Magna Cum Laude of Centenary College of Louisiana. While at Centenary he received a Woodrow Wilson Fellowship and later pursued graduate studies at the University of Wisconsin in 1961-1962.

La Grone began his Federal career in 1962 as a management intern with the Atomic Energy Commission in Albuquerque and later held a number of positions in Washington, D.C. with the AEC. In 1972-1973 he was a Congressional Fellow. La Grone joined SAN in 1975 as an Assistant Manager.

A native of Deadwood, Texas he is married to the former Peggy McDaniel of Rockhill, Texas. They have three children - Paige, Dana, and Jeff - and live in Oak Ridge, Tennessee.

#

July 1983

MERCURY WATER ANALYSES
WATER SAMPLE RESULTS TAKEN FROM
EAST FORK POPLAR CREEK

MERCURY WATER ANALYSES

WATER SAMPLE RESULTS TAKEN FROM EAST FORK POPLAR CREEK (Mercury mg/L)

1983--Method of Analysis:
Flameless Atomic Absorption
Limit of Error: $\pm 20\%$ at 0.001 mg/L
Quality Control Program from 1979 to Present

<u>YEAR</u>	<u>JAN.</u>	<u>FEB.</u>	<u>MAR.</u>	<u>APR.</u>	<u>MAY</u>	<u>JUNE</u>	<u>JULY</u>	<u>AUG.</u>	<u>SEP.</u>	<u>OCT.</u>	<u>NOV.</u>	<u>DEC.</u>
1983	.002	<.001	<.001	.001	<.001							
	.001	<.001	<.001	<.001	<.001							
	<.001	<.001	<.001	.001	<.001							
	.001	<.001	<.001		.001							
	<.001				.002							

SEDIMENT, WATER, AIR & SOIL DATA

Supplement to Exhibit 5

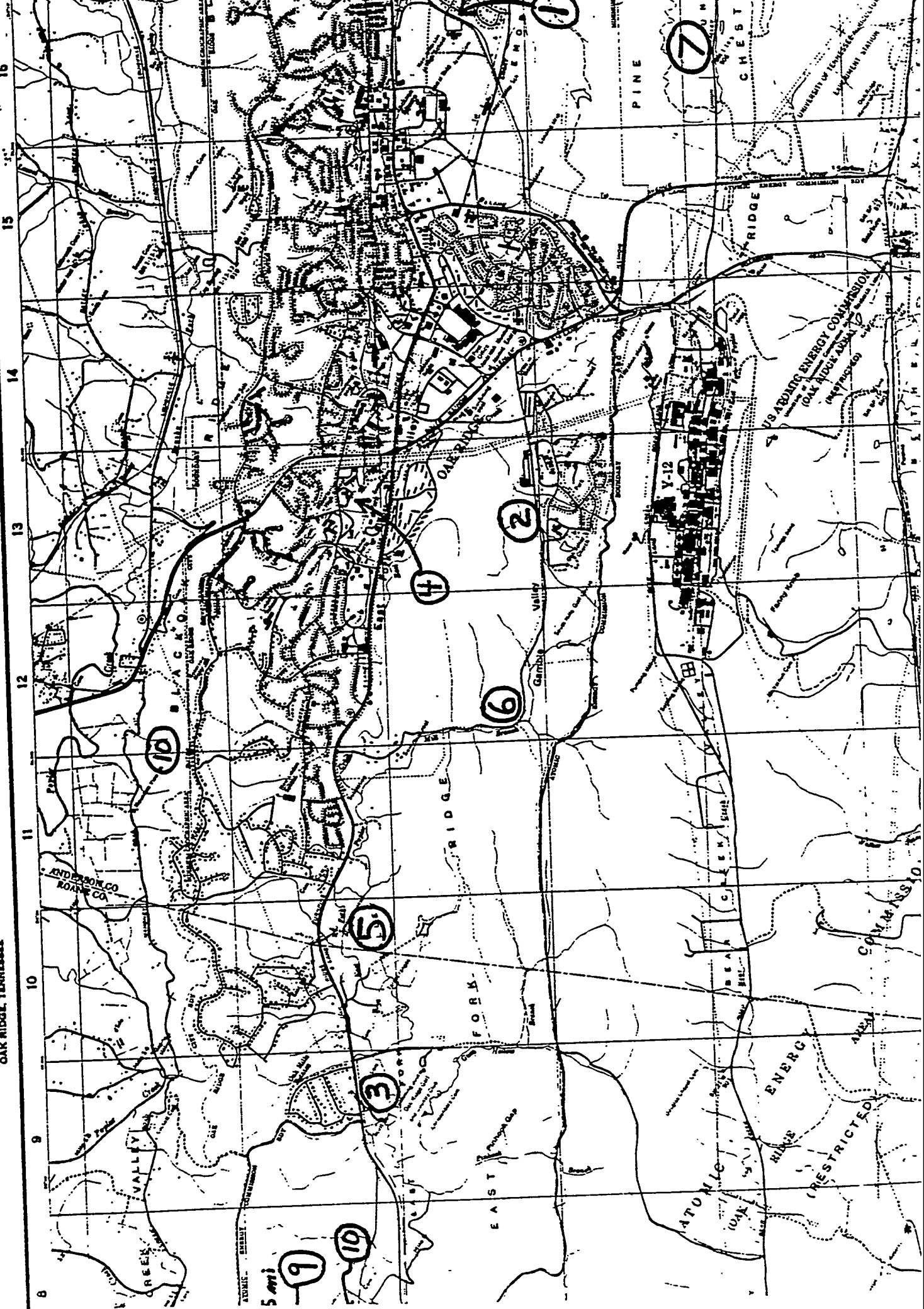
MERCURY SAMPLING AND DATA

The sampling locations listed below are identified on the attached map.

1. Fairbanks Road
2. Scarboro Community
3. Greenvview Estates
4. Robertsville Junior High School
5. East Fork Poplar Creek
6. West Tuskegee Drive
7. Background, Union Road
8. Background, Freels Bend
9. East Fork Poplar Creek at Confluence with Poplar Creek
10. Background, Non-Contaminated Areas

OAK RIDGE AREA

OAK RIDGE, TENNESSEE



1. FAIRBANKS ROAD

* SOIL (parts per million)

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
Fairbanks at Emory Valley Road	6/22/83	83-0105	2.88 ppm
Fairbank Road	6/22/83	83-0106	1.05 / .37
Jefferson Junior High School	6/22/83	83-0107	78.
Entrance - Sewer			
Warehouse Road	6/22/83	83-0108	150.
Fairbanks Road	6/22/83	83-0109	334.
Fairbanks Road	6/23/83	83-0110	130.
Fairbanks Road	6/23/83	83-0111	127.
Fairbanks Road	6/23/83	83-0112	148.
Fairbanks Road	6/23/83	83-0113	47.
Fairbanks Road	6/23/83	83-0114	0.410
Belgrade Road	6/23/83	83-0115	0.40
Belgrade Road	6/23/83	83-0116	0.270
Belgrade Road	6/23/83	83-0117	0.230
Colgate Road	6/23/83	83-0118	0.066
Colgate Road	6/23/83	83-0119	0.056
Colgate Road	6/23/83	83-0120	0.064
Colgate Road	6/23/83	83-0121	0.90
Colgate Road	6/23/83	83-0122	0.046
Colgate Road	6/23/83	83-0123	0.038
Colgate Road - Wet Weather Stream Bank	6/23/83	83-0129	13.5

2. SCARBORO COMMUNITY

* SOIL (parts per million)

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
Bethune Circle	6/24/83	83-0138	0.04 ppm
Bethune Circle	6/24/83	83-0139	0.08
Bethune Circle	6/24/83	83-0140	0.064

5. EAST FORK POPLAR CREEK

* SOIL (parts per million)

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
Gum Hollow Road	6/24/83	83-0132	0.390
Gum Hollow Road	6/24/83	83-0133	0.950
Gum Hollow Road	6/24/83	83-0135	0.730
Greystone Lane	6/24/83	83-0136	0.214
Wiltshire Blvd.	6/28/83	83-0149	0.25
Wiltshire Blvd.	6/28/83	83-0150	0.206
Wiltshire Blvd.	6/28/83	83-0151	0.20
Wiltshire Blvd.	6/28/83	83-0152	0.136
Wiltshire Blvd.	6/28/83	83-0153	0.24
Wiltshire Blvd. - Sewer Line Beltway	6/28/83	83-0157	37.
Wiltshire Blvd. - Sewer Line Beltway	6/28/83	83-0158	9.3
Wiltshire Blvd. - Sewer Line Beltway	6/28/83	83-0159	22.0
Wiltshire Blvd. - Sewer Line Beltway	6/28/83	83-0162	65.0
Wiltshire Blvd. - Sewer Line Beltway	6/28/83	83-0163	31.0

9. EAST FORK POPLAR CREEK AT CONFLUENCE WITH POPLAR CREEK

* SEDIMENT (parts per million)

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
EFPC at confluence with Poplar Creek	6/22/83	83-0099	118 ppm

* WATER (parts per billion)

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
EFPC at confluence with Poplar Creek	6/22/83	83-0100	<0.05 ppb

10. BACKGROUND, NON-CONTAMINATED AREAS

* SOIL (parts per million)

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
Black Oak Ridge	6/22/83	83-0097	<0.05 ppm
Black Oak Ridge	6/22/83	83-0098	0.10 / 0.054
Lambert's Quarry on Side of Black Oak Ridge	6/22/83	83-0102	0.046

* WATER (parts per billion)

LOCATION	DATE COLLECTED	SAMPLE	RESULTS
Lambert's Quarry on Side of Black Oak Ridge	6/22/83	83-0101	<0.05 ppb
Mahoney Road, Northwest of Black Oak Ridge	6/28/83	83-0146	<0.05
Mahoney Road, Northwest of Black Oak Ridge	6/28/83	83-0147	<0.05

VEGETABLE DATA

MERCURY IN VEGETABLES

<u>Vegetable</u>	<u>Mercury Content (PPM)</u>	<u>Soil Analysis (PPM)</u>
Tomato (1 sample)*	<0.003	0.214

*From Garden on Greystone Lane

ChemRisk Document Request Transmittal Form

(This section to be completed by ChemRisk)

Name S. Sandberg Division ISD is requested to provide the following document

Address _____

Date of Request 12/10 Expected receipt of document 12/21

Title of requested document Statement of Joe Fabrone Manager
ORR...

Document Number 702522

Access Number of Document _____ Date of Document 7/11/83

(This section to be completed by Derivative Classifier)

Derivative Classifier R.G. Jordan Phone 41645

Date document transmitted to Dr. Quist 4/15/93 CO 1/29/93

Date release received from Dr. Quist but 2/2/93

PUBLIC RELEASE STAMP attached to each copy of document (YES NO)

Date document sent to reproduction _____ Expected Return _____

Delivered to DRC by _____ Date _____

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Processed _____

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1993 FEB -3 PM 5:23

OAK RIDGE K-25 SITE DOCUMENT RELEASE FORM

Person requesting release JENNIFER LAMB (CHEMRISK) Telephone No. 4-0745

Mailing Address K-1200 MS-7262 Division or Organization 1/29/93

Date by which release is required _____

Some documents require special review and the pro- Rec'd K-25CO: JLamb 1/29/93

Note: Two copies of the document must generally be provided to the Classification and Control Office. One copy of photos and videotapes is required. Documents that include photos must also include a "list" of the photos. AS Quist, 2/2/93

Approval of request for Classification and Information Control Office to release document (department head or higher):

Signature: _____ Date _____

DOCUMENT DESCRIPTION (to be completed by requester)

Document number UNNUMBERED/702522 Pages 120

Document title STATEMENT OF JOE LA GRONE MANAGER, OAK RIDGE OPERATIONS, U.S. DEPARTMENT OF ENERGY, BEFORE THE SUBCOMMITTEES ON ENERGY RESEARCH AND PRODUCTION AND OVERSIGHT AND INVESTIGATION OF THE HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY

NO AUTHOR GIVEN

Author(s) (indicate other divisions or organizations, if applicable) _____

Document type (See Doc. Prep. Guide, Chs. 1 and 2, for definitions of document types):

- ☒ Formal Report ☐ Progress Report ☐ Informal R&D Report ☐ Abstract ☐ Drawing
☐ Administrative ☐ Correspondence ☐ Internal Technical Data ☐ Photo ☐ Other Visuals
☐ Journal Article (identify journal): _____
☐ Oral Presentation (identify meeting, sponsor, location, date): _____

Will oral presentation be published in program, booklet, brochure, etc.? ☐ Yes ☐ No ☐ Not Known

Will copies of the oral presentation be distributed ☐ before, ☐ after, ☐ during the meeting? ☐ No distribution will be made.

Other (specify): _____

Purpose of release HEALTH STUDY FEASIBILITY PROJECT

Previously cleared documents containing similar information _____

Is copyrighted material contained in this document? (If present, attach release.) ☐ Yes ☒ No

Remarks _____

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Was the work reported in this document funded, in whole or in part, by a classified program at Martin Marietta Energy Systems, Inc.?

☐ No ☐ Yes (Name of program: _____)

Is the subject area of this document closely related to a prior or current classified program at Martin Marietta Energy Systems, Inc.?

☐ No ☐ Yes Within the Department of Energy? ☐ No ☐ Yes

Name or Description of applicable program(s) _____

Additional remarks _____

This document contains no classified information.

Derivative Classifier signature TK.95.1 Date 1/14/93

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☐ Applied Technology *

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☐ Naval Nuclear Propulsion Information *

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☐ Sensitive Nuclear Technology *

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PATENT INFORMATION (completed by requester)

Does this document disclose any new equipment, process, or material?

☐ Yes

☐ No

If yes, list the patent significance and identify page number(s) and line number(s) in the space immediately following (or attach separate pages).

PATENT SECTION ACTION (completed by Patent Section upon request by the Classification and Information Control Office)

☒ Document may be released for publication

☐ Document must be reviewed by DOE Patent Group before release

☐ Document contains patentable information and may not be released at this time

Remarks: _____

Patent Section Representative _____

Date

2/2/93

CLASSIFICATION AND INFORMATION CONTROL OFFICE ACTION (completed by Classification and Information Control Office)

Classification Office
Action Taken:

☐ Not approved for release (see below)

☐ Approved for release with changes (see below)

☒ Approved for release without change

Classification Officer signature _____

Date

2/2/93

Technical Information
Office Action Taken:

☐ Not approved for release (see below)

☐ Approved for release with changes (see below)

☒ Approved for release without change

Technical Information Officer Signature _____

Date

2/2/93

Send to OSTI?

☐ Yes

☒ No

Category Distribution: _____

DOCUMENT NUMBER: UNNUMBERED/702522

DOCUMENT TITLE: 5 PHOTO GRAPHS (PHOTO COPIES) (PHOTOS OF OLD MERCURY
PLANT AND THE VARIOUS STAGES OF THE MERCURY PROCESS)

AUTHORS: NO AUTHOR GIVEN

DOCUMENT TYPE: PHOTO GRAPHS (PHOTO COPIES)

DOCUMENT DATE: NOT DATED

PURPOSE OF RELEASE: HEALTH STUDY FEASIBILITY REPORT

COPY RIGHTED MATERIAL: NO

DOCUMENT NUMBER: UNNUMBERED/702522

DOCUMENT TITLE: UNCLASSIFIED VERSION OF MERCURY INVENTORY AT Y-12
PLANT 1950 THROUGH 1977

AUTHORS: JM CASE

DOCUMENT TYPE: CORRESPONDENCE

DOCUMENT DATE: 06-09-77

PURPOSE OF RELEASE: HEALTH STUDY FEASIBILITY REPORT

COPY RIGHTED MATERIAL: NO

DOCUMENT NUMBER: UNNUMBERED/702522

DOCUMENT TITLE: MERCURY LOSSES TO EAST FORK POPLAR CREEK

AUTHORS: NO AUTHOR GIVEN

DOCUMENT TYPE: LINE GRAPH

DOCUMENT DATE: NOT DATED

PURPOSE OF RELEASE: HEALTH STUDY FEASIBILITY REPORT

COPY RIGHTED MATERIAL: NO

DOCUMENT NUMBER: UNNUMBERED/702522

DOCUMENT TITLE: MERCURY WATER ANALYSES WATER SAMPLE RESULTS TAKEN

FROM EAST FORK POPLAR CREEK

AUTHORS: NO AUTHOR GIVEN

DOCUMENT TYPE: SAMPLE TABLES

DOCUMENT DATE: NOT DATED

PURPOSE OF RELEASE: HEALTH STUDY FEASIBILITY REPORT

COPY RIGHTED MATERIAL: NO

DOCUMENT NUMBER: UNNUMBERED/702522

DOCUMENT TITLE: FISH DATA FOR EAST FORK POPLAR CREEK, BEAR CREEK,
POPLAR CREEK AND THE CLINCH RIVER

AUTHORS: NO AUTHOR GIVEN

DOCUMENT TYPE: COVER SHEET ONLY FOR A REPORT

DOCUMENT DATE: NOT DATED

PURPOSE OF RELEASE: HEALTH STUDY FEASIBILITY REPORT

COPY RIGHTED MATERIAL: NO

DOCUMENT NUMBER: ORNL/CF-82/257/702522

DOCUMENT TITLE: ORNL REPORT ORNL/CF-82/257 "MERCURY CONTAMINATION IN
EAST FORK POPLAR CREEK AND BEAR CREEK"

AUTHORS: W VAN WINKLE, ET AL

DOCUMENT TYPE: REPORT

DOCUMENT DATE: 09-07-82

PURPOSE OF RELEASE: HEALTH STUDY FEASIBILITY REPORT

COPY RIGHTED MATERIAL: NO

DOCUMENT NUMBER: UNNUMBERED/702522

DOCUMENT TITLE: SEDIMENT, WATER, AIR & SOIL DATA

AUTHORS: NO AUTHOR GIVEN

DOCUMENT TYPE: REPORT

DOCUMENT DATE: NOT DATED

PURPOSE OF RELEASE: HEALTH STUDY FEASIBILITY REPORT

COPY RIGHTED MATERIAL: NO

DOCUMENT NUMBER: UNNUMBERED/702522

DOCUMENT TITLE: VEGETABLE DATA

AUTHORS: NO AUTHOR GIVEN

DOCUMENT TYPE: REPORT

DOCUMENT DATE: NOT DATED

PURPOSE OF RELEASE: HEALTH STUDY FEASIBILITY REPORT

COPY RIGHTED MATERIAL: NO

DOCUMENT NUMBER: UNNUMBERED/702522

DOCUMENT TITLE: MEMORANDUM OF UNDERSTANDING BETWEEN THE U.S.
DEPARTMENT OF ENERGY AND THE U.S. ENVIRONMENTAL
PROTECTION AGENCY AND STATE OF TENNESSEE DEPARTMENT
OF HEALTH AND ENVIRONMENT CONCERNING COMPLIANCE
WITH POLLUTION CONTROL STANDARDS AT THE DEPARTMENT
OF ENERGY Y-12 PLANT, ANDERSON AND ROANE COUNTIES,
TENNESSEE

AUTHORS: HD ZELLER (EPA), MT BRUNER (TDHE), J LA GRONE (DOE)

DOCUMENT TYPE: PROGRESS REPORT

DOCUMENT DATE: 05-26-83

PURPOSE OF RELEASE: HEALTH STUDY FEASIBILITY REPORT

COPY RIGHTED MATERIAL: NO

DOCUMENT NUMBER: UNNUMBERED/702522

DOCUMENT TITLE: MERCURY WATER ANALYSES WATER SAMPLE RESULTS TAKEN
FROM EAST FORK POPLAR CREEK

AUTHORS: NO AUTHOR GIVEN

DOCUMENT TYPE: REPORT

DOCUMENT DATE: NOT DATED

PURPOSE OF RELEASE: HEALTH STUDY FEASIBILITY REPORT

COPY RIGHTED MATERIAL: NO
